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A Voyage in Space*

By W. CARL RUFUS

The earth is sailing around the sun carrying all of us with a speed of eighteen and a half miles per second. Listen! Tick-tock. Eighteen and a half miles. During the time I am allotted to speak, the earth will carry us 30,000 miles from our starting point, no matter if you turn off your radio or tune in on something else.

Our bodies are bound to the spinning earth, a small planet, 8000 miles in diameter, by the force of gravity, which is so great that we will not fall off; so great, indeed, that we cannot possibly get away. But we are free in mind. We look out into space and see the sun, moon, and stars, out of reach of our hands, inaccessible in the physical sense. But light with its secret message comes across the vast expanse; the only thing that brings information from the starry heavens.

On our voyage in space we must leave the earth and our bodies far behind. Our minds have a long way to go. Let us take the fastest thing in the universe: that is light. Light darts through space with a speed of 186,000 miles per second; and according to Einstein, that is the maximum speed in the physical universe.

Perhaps you have heard the old limerick:

> There was a professor named White,
> Who could travel much faster than light.
> He started one day in a relative way
> And arrived on the previous night.

That professor was too fast; he arrived before he started. That's what happens if you travel faster than light.

Now, if you are ready, let's go. Step on the light! We are off; seven times around the earth in a single second. Goodbye Lindbergh! We are headed for the moon. In one and a third seconds we reach that cold, dark body, that shines only by reflected sunlight. No water, no atmosphere, no life. Rugged mountains and cliffs, some peaks 20,000 feet high. Huge circular formations called craters, some 50 miles or even 100 miles across. Vast rocky plains, wrongly called seas, dark by contrast, producing what is known as the man in the moon. The moon revolves about the earth once a month and accompanies it in its annual journey around the sun. One half of the moon is lighted by the sun and we see different parts of that side as the moon passes through its phases.

In eight and one-third minutes we reach the sun. On an airplane at 100 miles per hour that would take a hundred years. A ticket at three cents a mile would cost nearly $3,000,000. The sun is a typical yellow

*The text of a radio talk, broadcast from the University of Michigan station.

star, gaseous and self-luminous with a temperature of 6000 degrees, providing heat and light for the earth and other planets. Even life on the earth depends on its radiation. On account of its large mass, 330,000 times that of the earth, it controls the motions of the planets, holding them in their orbits, pulling on the earth with an unseen force that would require the full strength of ten million steel cables 93 million miles long each one a mile in diameter.

On we go. Let us look back. The earth is far away shining brightly, like the planet Venus. Near by is the dim and fading moon, almost lost from sight. We pass Mercury and Venus and in a few minutes reach Mars with its day and night and seasons similar to the earth's. Polar caps form in the winter and disappear in the summer. Green areas increase in size and color during spring and summer. They are connected by narrow streaks of similar nature first seen by Schiaparelli, an Italian astronomer, and called "canali," meaning channels, but wrongly translated canals. The green areas including the connecting streaks are probably due to vegetation. It is rather cold here as Mars, due to its great distance, receives only four-ninths as much light and heat from the sun as the earth enjoys. Its average temperature is far below zero, even in the torrid zone. Its atmosphere is also very rare and there is very little water. Altogether, the physical conditions are not suitable for life as we know it on the earth. Imagination may picture other types of life, including intelligent beings, but science does not have sufficient evidence for a positive conclusion.

On we go passing Jupiter, Saturn, Uranus, and Neptune with their satellites. Occasionally a comet is passed. In less than six hours we reach Pluto, the most distant planet belonging to the sun's family. Looking back, the earth and moon have disappeared and the sun is only one fifteen-hundredth as bright as seen from the earth. It is very cold now, probably 200° below zero on Pluto; just beyond its surface we have the cold of space 273° below. On we go passing a few more comets, leisurely following a long path around the sun, some of them taking several hundred years to complete the journey.

Now we must settle down on a long ride to the nearest star, Proxima Centauri. Over four years are required. Recalling distances on our voyage, it was one and a third light seconds to the moon, eight and a third light minutes to the sun, and nearly four and a third light years to the nearest fixed star. The light year is the unit used for distances of the stars and, as its name indicates, is the distance light travels in one year, about 6 trillion miles, *i.e.* 6 with 12 zeros following. Such a great distance is difficult to comprehend. The light year merely helps to express it. Proxima Centauri is a faint star near Alpha Centauri which is a beautiful bright star in the southern hemisphere not far from the Southern Cross, invisible at Ann Arbor. Let us send back a description for the morning paper. How shall we send it? Special messenger? Graf Zeppelin? That would require 30 million years. Total cost?

Let's not attempt it. Tips to the porter at 50 cents a day would cost 5 billion dollars.

Let us stick to the light. On we go. In nine years we reach Sirius, the brightest star as it appears from the earth, on account of its relative nearness. You may see it on a winter night, if clear, as it follows Orion across the sky. Observations on Sirius over 100 years ago showed that it deviated from a straight and narrow path. Bessel, a German astronomer, placed the blame on a dark, unseen companion. Spies found the culprit, which turned out to be a white dwarf star, one of the most interesting objects in the universe. It has about one ten-thousandth the luminosity of Sirius and two-fifths the mass. It is white hot, so the surface is very bright. It must be very small, therefore, to give such a small amount of light. Its mass is large, however, so its density must be very great. Eddington gives its value, about 50,000 times that of water. One gallon would weigh 200 tons. A spoonful of that star-stuff would be a truck load. The great effect of gravitation on light at its surface has been used as a test of Einstein's theory of relativity, which implies that light has mass and, like matter, is subject to gravitation. Light escapes from this dense body with a loss of energy, so lines in its spectrum are displaced toward the red where the vibrations are not so rapid.

On we go, a hundred years, passing a few near stars. In two hundred years we reach Betelgeuse, that red giant star in the constellation Orion, giving light 1200 times that of our sun. This is the first star whose diameter was measured by Michelson with an interferometer,—240 million miles. Antares, a red giant in Scorpio, surpasses it in size. That star is so large that if we place our sun at its center, in imagination, and around the sun the orbits of Mercury, Venus, and the Earth, we may then go out in the solar system as far as the orbit of Mars and still be within its surface. A giant star is a big blown-up bubble of gas with a density about one three-millionths that of water. Furthermore, the measured sizes of Betelgeuse and Antares are changing in keeping with a change in the intensity of their light; giving observational evidence in support of the theory of the pulsation of variable stars, alternately contracting and expanding in periods of various lengths.

On we go on the wings of light, 400 years, 500. In 600 years we come to Deneb, gem of the Northern Cross, with light 10,000 times that of our sun. At about the same distance is Canopus, queen of the southern sky, invisible at Ann Arbor. We saw Canopus on Christmas Eve at Miami, Florida, when we were attending an outdoor musical at Biscayne Park. There it sparkled above the waters of the Bay. Perhaps our mind wandered a moment from the music as we beheld its grandeur and contemplated its greatness. It gives light and heat 80,000 times that of the sun. How would you enjoy a sun like that? At the distance of our sun it would burn the earth and its inhabitants to cinders and change the cinders into gas.

On we go, and here is the Orion Nebula, a beautiful shining mass of gas, surrounding the central star of the sword of Orion hanging below his belt. It is three light years across its luminous center, probably ten to its fainter parts. In spite of its vast extent it has comparatively small mass, possibly 10,000 times that of an ordinary star. That would mean an extremely low density, far lower than the best vacuum any laboratory can produce. Let us compare the density of the nebula with the density of air. Do you think it could be as low as one-millionth of air? Lower than that: about one millionth of one billionth of the earth's atmosphere. So we pass, on our Voyage in Space, the densest type of matter in the universe, the white dwarfs, and the most tenuous, the luminous gaseous nebulae. For centuries the composition of the nebulae was a puzzle. Bright lines in the spectrum indicated a glowing gas. But some of the lines were not identified with any terrestrial element. Because they were found only in the spectra of the nebulae they were attributed to a hypothetical substance named nebulium. A similar case was the discovery of helium in the sun (Greek - helios) before it was discovered on the earth. Nebulium has recently been identified, not as a new element, however. It turns out to be ionized oxygen and nitrogen, two of the elements most abundant in the air we breathe; an interesting illustration of the unity of the universe.

On we go, passing a few Cepheid variable stars, which some of us believe are pulsating giants. At the Observatory of the University of Michigan we have devised a method of measuring the ebb and flow of the gases in the pulsating atmospheres.

On and on we go on the wings of light. 1000 years. 10,000, 100,000. And we are not growing old. Einstein says that time on a light wave is always zero. We are living in the eternal *now*. Here the stars are fewer, we are near the limits of our Milky Way system with its 50 billion stars of which our sun is one, now lost from sight in the diffused glow of the galaxy. We have reached the region of the beautiful star clusters, where thousands appear to be crowded together in limited space. The great globular cluster in Hercules contains at least 50,000 stars which is surpassed by Omega Centauri. The motion of the individual stars of a cluster follows the same law, the equipartition of energy, that is obeyed by the atoms and molecules of the air in your room; the greater the mass the slower the motion and the smaller the mass the greater the speed; another interesting illustration of uniformity throughout the universe.

On we go. 200,000 years; 500,000. We are far beyond the limits of the Milky Way. Looking back, our entire sidereal system, with its 50 billion suns is merely a shining hazy patch against the sky. The sun has disappeared. The earth is lost beyond hope of discovery. Where is the proud work of the hand of man, the gigantic pyramids of Egypt or the skyscrapers of New York? Where is man himself with his six-foot box of clay?

On we go. We have reached the region of the spiral nebulae so-called. But they are not nebulae in the true sense. They are other systems of stars, far beyond our galaxy, something like our own sidereal system. Here is the spiral in Andromeda at a distance of nearly one million light years, another galactic system. "Extra! Extra!" All about the Andromeda nebula. A new star was discovered. "Extra! Extra!" Tell your editor that's no scoop. Tell your reporter that's old stuff. That star blazed out over 800,000 years ago.

On we go, passing spirals by the thousands, each one another galaxy of stars. Hubble with the world's largest telescope, the 100-inch reflector at Mt. Wilson, places the number of spirals at 75,000,000. On we go and the spirals seem to be receding. Accepting the redward shift of spectrum lines as a measure of the velocity of recession, just as we do in the case of stars within our galaxy, the spirals are attempting to leave us and they are moving away with increasing speeds at increasing distances. This gives a semblance of observational evidence in favor of the theory of an expanding universe, which you may adopt if you think that the universe is not large enough already. On and on we go 10 million years, 100 million, 150 million. We are reaching the limit of detecting spirals using best microscopic methods to glimpse the faint dots on the most sensitive photographic plates attached to the giant reflector. Here is a spiral in Gemini at a distance of 150 million light years receding with the enormous velocity of 15000 miles per second or about one twelfth the speed of light.

On and on we go, on the wings of light, overtaking and passing the spirals. A 200-inch reflector is in process of construction with greater space penetrating power, sufficient to reveal millions more of the spirals at greater distances. Will the more distant ones continue to increase their speed? Will we be able to overtake them in this mad chase?

On and on we go with the speed of light. But suddenly the celestial policeman holds up his hand. Stop! does he say? No, we cannot stop. We cannot even cut down our speed. The velocity of light is constant. Detour! Einstein says that the space-time universe is curved. Light bends under the sway of gravitation and can never leave the material universe. What does that mean? On our voyage in space we have travelled 150 million years with the speed of light and we are still at the center of the universe. From that standpoint we might just as well have stayed at home on the earth in a comfortable rocking chair. Like Alice in Wonderland we run and run just to stay where we are.

But we have learned something on our way; something regarding the nature of light, the magic chariot in which we took our imaginary flight. What is light? Let Brownell in his book "The New Universe" attempt to answer. "Light becomes the standard and the test of motion; and the pure speed of light measures other motions and the world of space and time. Light, burning, vibrating, golden; no one knows just what it is. In the beginning, says the ancient book, there was light; but modern

men of science might more nearly say light is the beginning."

Let us turn back from distances almost infinite and direct the light rays from sun and stars and nebulae through waiting prisms and other instruments. By this method we may continue our voyage in space within an atom, infinitesimal space, where lies concealed the mystery of the source of light. Not long ago the atom was considered the ultimate unit of matter, a tiny hard particle, a little nut, too hard to crack. But we can enter today through doors and windows opened by spectrum analysis. We find ourselves within a miniature system. At the center is a nucleus formed of protons, electrons, neutrons, and positrons. Around the nucleus, which is positively charged electrically, dance the sprightly electrons, each one carrying a unit negative charge. Again we must change our unit of distance. The mile was too small for the stars; the inch is to large for the atom. We use the Angstrom unit, about one two-hundred fifty millionth of an inch. The diameter of an electron is less than four-billionths of an Angstrom, and the proton is even smaller. In the hydrogen atom the electron moves around the central proton at a distance of half an Angstrom in its lowest energy state. That distance is large, however, compared with the size of the electron, larger than the distance of the earth from the sun compared with the size of the earth. So there is plenty of unoccupied space for our voyage within the atom, as great proportionally as we found on our way to the planets. Once around in this lowest state is assumed to be the unit of action, the least amount of work that can be done, which is always of interest to some people. The atom takes on energy and gives it off in definite amounts which are exact multiples of this unit. Energy as well as matter is atomic. When the atom gives off energy, out comes a ray of light, no one knows exactly how or why. Eddington says concerning action within the atom: "Something unknown is doing we don't know what." But out comes a ray of light always with the maximum speed attainable in the universe, 186,000 miles per second. And the frequency of action of the electron within the atom corresponds with the frequency of the light, that is the number of light waves per second that pass a given point. For example the red ray of hydrogen has a frequency of 450 trillion per second and the energy, which is proportional to the frequency, corresponds with a fall of the electron from the third to the second energy state. Light may also be atomic and the unit is called a photon. At least 17 of these are required to affect the eye, *i.e.* to produce the sensation of light. But they must have the right frequency. Not all radiation can be seen with the human eye. Some of the frequencies are too small: these rays are beyond the visible red end of the spectrum; some are too great and are beyond the visible violet. Beyond the violet are the X-rays, gamma rays, and cosmic rays of extremely short wave length.

How are these formed within the atom and shot out at such an enormous speed? An attempt to follow the electron in its action within the

atom meets with difficulty. Here our sight fails us, even our photographic plates or other devices for observation fail, because in order to detect the electron it must be illuminated and the impingement of radiation disturbs its action, indeed it may even be driven out of the atom. The best that we can do at a given time is to find where it is or how fast it is going, it refuses to give both its position and its velocity at the same instant. For this reason and others some physicists do not believe in the electron as a tiny hard mass particle but call it an "energy packet," a sort of hide-and-seek set of interlaced and interlocked modes of motion, sometimes partaking of the nature of a particle and sometimes like a wave.

Locked within the atom is the source of the light of sun and stars. The sun is emitting energy at an enormous rate. Sunshine on the earth's surface is equivalent to 4,700,000 horsepower per square mile. A like amount is poured through every square mile of space around the sun at the distance of the earth. On and on it goes on its voyage in space, lost from the sun forever. What maintains this enormous expenditure of energy? The best answer is,—it comes from the atoms that compose the mass of the sun. By the principle of the equivalence of mass and radiant energy we compute the loss of mass of the sun 4,200,000 tons per second. Statistical evidence from the stars and measurements in physical laboratories support the hypothesis of the transformation of mass into radiation. So the last word in science seems to be that the sun and stars are shining themselves away.

Out of the infinitesimal space within the atom come the rays of light, out they go into the vast expanse of the sidereal system, far beyond the Milky Way, on they go into the region of the spirals, losing themselves in the uncharted regions of the great beyond.

Such is our voyage in space and time. In half an hour our minds have travelled distances beyond expression, both great and small, and encompassed time immeasurable. We have transcended space and time and surpassed the speed of light in our quest for knowledge, while our bodies still cling to the spinning earth as it continues its endless course around the sun.

Ann Arbor, Michigan, March, 1935.

The Lafayette Meteorite*

By H. H. NININGER

Nothing is known regarding the time at which this remarkable meteorite fell, but its fresh appearance renders it practically certain that it had not lain on the earth for a very long time before it was picked up and protected against abuses of a mechanical nature. The story is told that a colored student of Purdue University reported that a number of years ago while fishing at the edge of a little lake he was frightened by the falling of a stone at a distance of only a few feet from him. This

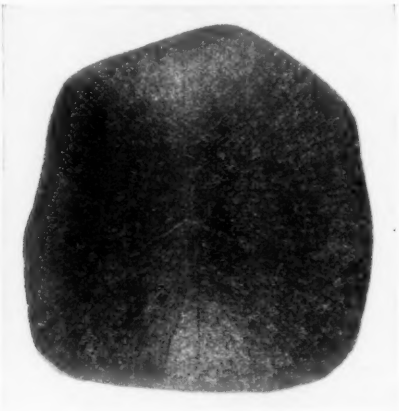

FIGURE 1.
FRONT VIEW OF THE LAFAYETTE METEORITE.
The arrangement of the thread lines evidences an oriented flight. The entire surface here shown consists of a blackish fusion crust. Reduced to one-half linear scale.

stone he later dug from the soft mud and found it to be "shaped just like a corn pone" and of about the same size. For a time he preserved the stone. It was thought that he had brought it to the University, but these reports have not been substantiated for the reason that the person could not be located.

Whatever its history the meteorite was first recognized by Dr. O. C.

*The Lafayette meteorite was to have been described by the late Dr.O.C.Farrington of the Field Museum. Subsequent to his death a search through his papers revealed no notes on the specimen. The honor of describing it was extended to the writer. Certainly no more beautiful meteorite was ever described and surely no one could have done it so well as would Dr. Farrington, had he lived.

The photographs used in this paper have been selected from those prepared for Dr. Farrington by the Photographic Department of Field Museum.

Farrington while classifying some minerals and rocks for the department of geology in Purdue University in 1931. Up until that time the stone had been regarded as a glacial boulder or pebble and the surface markings were thought to have been scratched due to its glacial origin.

To a student of meteorites the Lafayette stone at once becomes a very impressive example of the results of an oriented flight through the atmosphere. So far as is known to the writer no meteorite records such a flight more perfectly or more graphically.

As shown in Figure 1 this aerolite is almost perfectly symmetrical, being of a form which partakes about equally of the characteristics of a low pyramid and a section of a sphere, with a base which is almost flat but slightly convex.

FIGURE 2.
SIDE VIEW OF THE LAFAYETTE METEORITE
as viewed from the bottom of Fig. 1.
Showing a tendency for the threadlines to develop a bead-like condition. The dark area near the apex is due to a shadow. A portion of the base is seen in the lower part of the figure. Reduced to one-half linear scale.

At a glance the position of the stone in flight is quite evident, for its spheroidal front is abundantly and almost evenly beset by a host of fine crinkley ridges of blackish glass which radiate from its central point; or rather from an elongated apical area, for the four sides of the original pyramid from which the present form seems to have been shaped were not exactly equal. Consequently, the thread lines meet on a sort of comb or ridge about 2 cms long.

The thread lines or ridges are not all of equal prominence but consist of principal or primary ridges which arise in the central area and continue unbroken to the periphery. Of these, 27 were computed. Between each two of the primaries are one to three secondaries which arise short of the central area and continue to the periphery. These may be in some cases quite as prominent as the primaries near the periphery but are usually less so. Besides the primaries and secondaries there are more or less abundant, smaller and less distant, ridges intermingled with which are abundant points and protuberances of various forms.

Above we have referred to the crinkly nature of these thread lines or ridges. In some places this characteristic merges into a sort of beaded

condition. This is particularly true in more sheltered areas such as that shown in the lower central portion of Figure 2 where the lined surface stands almost vertical to the base. Altogether the lined surface of the stone gives one the impression that it has been formed by the cooling down from a condition in which the surface of the entire front was in a liquid state to a temperature below the melting point of the stone which allowed the molten matter to congeal while in the process of being swept away. The high viscosity of the liquid resulted in the formation of more or less perfect beads where the sweep of air was not too powerful. The numerous small prominences between the thread lines are due in part to the same process. Apparently, however, these have to some

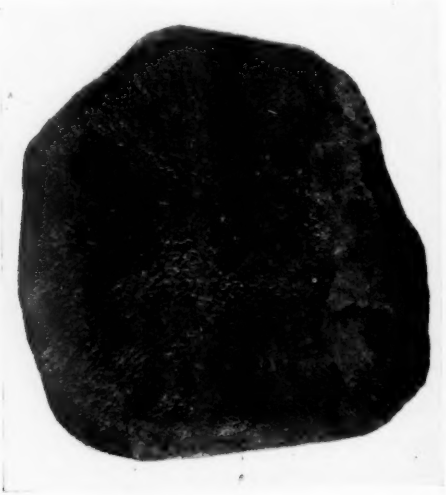

FIGURE 3.
THE BASE OF THE LAFAYETTE METEORITE.
Showing abundant small gas-explosion pits and the ridge (A) formed by the spilling over of fused material from the forward side. At the right the crust has been broken away. Another small piece has been detached near the lower left-hand corner.

extent resulted from the unequal melting of the underlying particles of stone, so that the more resistant points have been left projecting up under the glassy crust.

The base of the meteorite presents a decidedly different appearance. The wind-swept condition, which we have just described as obtaining on the forward convex portion, ends abruptly at the periphery where the almost flat base meets this convexity. Here, as is shown in Figure 3 is a noticeable ridge (A in Fig. 3) formed by the accumulation of spilled-over molten material from the forward side. An examination

of this ridge reveals that it is a porous black glass or slag which shows but little indication of any exposure to strong air currents. What evidence there is of such exposure is found in the form of short humpbacked ridges (*B* in Fig. 3) with pointed ends. These tend to lie in a plane parallel with the base of the meteorite and are seldom longer than one millimeter. These short ridges project toward the center of the base.

The entire base inside of the described ridge is covered with a heavy coating of slag or glass which is beset with little pits or craters—true gas explosion craters. This pitted surface appears to have been developed in a situation where almost no atmospheric disturbance existed save for occasional puffs which now and then dipped down from the terrific blast which was sweeping above it as the displaced atmosphere closed in furiously behind the on-moving projectile. Traces of these dips are recorded in very slight but perceptible drift lines reaching center-ward from the periphery, fading out usually before arriving at a point half way to the center.

Here in the wake of the moving mass was apparently an almost perfect vacuum. We find, however, in this stone no evidence that the heavy rear crust represents accumulations from the air-blasted forward side of the stone as has been suggested by various writers regarding certain meteorites and to support which we have found evidence in some cases. Had the rear crust been the result of over-spilling from the forward side then it should be heaviest near to the periphery where the bulk of the load would have been dropped, and a thinning of the crust should be noticeable between this and the center. Such is not the case, however. What we find is the very narrow ridge at the periphery, already referred to, with a uniformly heavy crust over the central portion. This crust in the central area evidences not the slightest disturbance from air currents. On the contrary, it appears to have been produced in a state of perfect calm, as, for example, in the glazing furnace of the potter. The many bubble-pits indicate a shallow seething pool of molten material which existed undisturbed. We may safely conclude that the rear side of the moving meteorite was free from the air blast which impinged so forcibly against its forward and lateral exposures, except for comparatively slight gusts which briefly swept an outer zone intermittently.

We may think of this rear side of the meteorite as a furnace, for over its edges came the violently heated blast of air which closed in to fill the constantly forming vacuum which was always advancing rapidly enough to elude the inrushing air. This super-heated and highly compacted air produced a very effective furnace between itself and the base which differed from the front exposure of the meteorite mainly in being in a state of calm, or rather being in a vacuum.

In meteorites traveling at several miles per second we encounter a condition which differs notably from that which obtains at lower velocities. The drop-shape with a rounded front and a tapering rear, which is con-

sidered the least resistant form in mechanical devices, is seldom attained in meteorites, probably for the reason that the velocity is too great. Consequently the destructive erosion which would be expected on the lateral and leaward slopes is not in evidence. In fact, the drop-shape is notably absent in meteorites. In the few instances where found, such as the Boogaldi and Charlotte irons, we find the evidences of aerial conflict limited to the rounded large end which was the forward end in flight probably because of its form rather than that the form resulted from this position.

Examination by the writer of several thousands of completely encrusted individual meteorites or bolides has convinced him that there is a critical velocity beyond which aerial friction operates differently from its effect at lower velocities. Above this critical velocity the leaward rear slopes of the moving body tend to escape the destructive effects of friction. Among meteorites which show evidence of an oriented flight there is a strong tendency toward flattish bases, such as the Lafayette stone exhibits. Even in those where the base is convex there is in many cases no indication of rapid erosion such as is evidenced on the anterior surface.

The interior of the Lafayette stone constitutes one of those rare instances of a meteorite which shows no metallic inclusions on a polished surface. Three polished surfaces were examined. In none was there found any trace of nickel-iron.

The interior appears almost uniformly of an olive drab color viewed from a distance. Closer scrutiny reveals that it is an aggregate of slender prismatic crystals of the color described, together with a sprinkling of lighter and darker particles some of which are almost black.

There is no suggestion of a chondritic structure visible on any of its three cut surfaces examined, nor on the portion of interior which has been exposed by the breaking away of the crust in a few places. The meteorite therefore falls in the division of achondrites. Dr. W. A. Waldschmidt of the Colorado School of Mines examined a sample of the stone and found it to be mainly a monoclinic pyroxine, probably diopside. Apparently, therefore, it should be classed with the nakhlites of Prior.

Because the location of the fall is not known it shall be known as the Lafayette meteorite which is the name of the city in which Purdue University is located.

The principal mass of the stone (about 600 grams) is preserved in the Geological Collection of Purdue University. Complete sections are also included in the Collections of the Field Museum and of the writer.

Colorado Museum of Natural History.

Starcrest Observatory

By DON H. JOHNSTON

The building of an observatory is always more or less of a problem. The writer spent over a year deciding what type was best suited to his needs and collecting data on observatories already built. Magazines were searched diligently and considerable correspondence carried on with owners who had constructed many different kinds and sizes. One fact seemed to be evident. All were ready to express a wish that this or that feature had been different.

So the obvious course to follow seemed to be to decide on the type and then avoid the bad features that were apparent and introduce improvements where possible.

FIGURE 1.

A dome was first studied as giving the astronomical look which most people associate with an observatory. However, to achieve a workmanlike job the dome is beset with difficulties. Unless the builder is experienced in sheet metal work he will do well to leave the dome alone. I had never seen one made of any other material that could be called a complete success. So the self supporting metal dome was ruled out as being too much for us to attempt with equipment and material available. Another reason was that a small dome with a narrow slit must be moved frequently while observing and it does not allow any considerable extent of the celestial sphere to be viewed at one time. This is an important feature.

A sliding roof design being finally decided on, the matter of size was the first consideration. Ten feet by ten feet was the size chosen. Anything less would be too small and not allow sufficient room around the telescope.

The matter of foundations was handled by setting piers three feet into the ground. To these piers the frame is bolted. The central pier to which the telescope pillar is bolted is a solid piece of concrete three feet by three feet extending into the ground to a depth of four feet. Bolts two feet long are embedded in the pier and extend through the iron flange of the pillar.

The floor joists were then laid in the usual manner for small buildings. Both the building and roof units are very rigidly framed. Where the siding carried by the roof overlaps that of the building, a clearance of ⅜ inch is provided.

It will be seen from the photograph that the front of the observatory is carried higher than the sides. This is a very good feature as it allows the telescope to be brought considerably lower in the east and west observing positions.

The tracks are two by six, twenty feet long. Therefore there are no joints in the track. This is quite important to secure a smooth working job. Two-by-fours laid edgewise and nailed on the under side of the tracks make them rigid where the track leaves the observatory and extends outside to support the roof when in the off position.

The six rollers are six inches in diameter and have plain bearings. It is not advisable to use a rubber tire as the weight of the roof will in time cause flat places to be formed with consequent hard rolling. Also too small a wheel is not desirable.

Iron L sections are bolted to the roof frame and are hooked under the track. This prevents the roof from rising and also guides the roof down the track. The sides of the track are rubbed with paraffin for the irons to slide on. There is no tendency to bind. The irons are four inches wide and half an inch thick and one is used at each corner right beside the end rollers.

Roof boards should be fir. This saves considerable weight. Roll roofing of a good grade is also the lightest material ordinarily available. Side boards are attached to the roof section and serve to cover the rollers. The front gable is carried on the main part of the building to the extent of two siding boards. The rest is part of the rolling section. This should carry a weather strip to keep water from driving in the crack between the two parts.

Drop siding makes a smooth interior finish and if the studding is not covered considerably more room is obtained. The interior is finished with two coats of orange shellac, as well as the roof boards and floor. This makes a pleasing and durable finish. A little time spent in smoothing up the wood adds much to the final result. A half-inch is allowed between the pillar base and flooring so no vibration is transmitted to the telescope from the floor.

One of the most important things to watch in building an observatory is to insist that every board be plumb and level. This makes for an easily moved roof. Nothing is more exasperating than a roof that sticks or does not roll easily.

Though the roof gave no trouble in this respect and from the first would slide off with little effort, it was thought best to devise some system of pulleys for still more positive operation.

The result was that Dr. Wm. H. Johnston, the author's father, worked out a design which does the work perfectly and with practically no muscular exertion. One pulley is fastened at each end of the roof. Two are fixed at the back side of the building on a bracket raised about a foot above the level of the back wall. Two ropes are used and one end of each is fastened to this bracket. The ropes then pass through

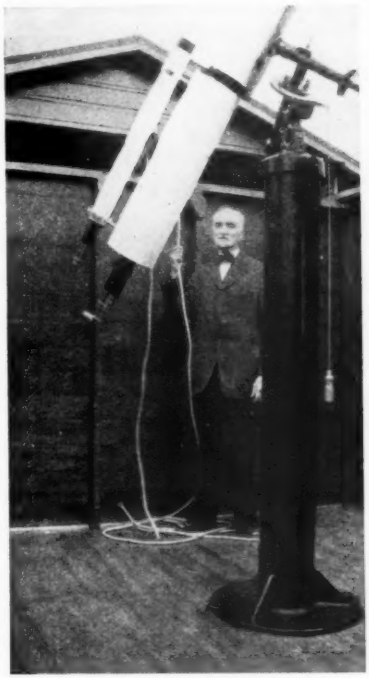

FIGURE 2.

the end pulleys at each end of the roof. They then go through the pulleys attached to the bracket. Thus by pulling one rope the roof rolls off while by pulling the other the roof returns. This is all accomplished from inside the observatory by the simple pulling of a rope and the necessary effort required is only half of that which would be used without the pulley system.

The telescope is a 6-inch refractor, largely made by myself with a few parts by Mogey. The pillar was made from 8-inch pipe with an iron flange welded on the bottom for a base. The regular pipe cap was

turned down, faced and drilled to accommodate the equatorial head.

A 2½-inch telescope is fitted as a finder on the main tube. There are no graduated circles but slow motion is had in R.A. by the handle hanging by the pillar.

The diagonal and most of the eyepieces were also home made. Finish is chromium plate; tube is white with black trimmings.

Although the author lives in Cleveland, the observatory was not built in the city owing to poor observing conditions. It was erected at Collins, Ohio, about fifty miles distant, on the highest point of ground between Cleveland and Toledo. Hence the name STARCREST Observatory. The seeing conditions are exceptional and a week-end night spent in observing is worth many nights in the city. Star charts, atlas, and astronomical books are contained in a combined bookcase and writing desk in one corner of the room.

The observatory is located on the Johnston farm (Collins, Ohio, or Townsend on Federal Road No. 20) where Dr. Johnston resides and the doctor will be glad to show anyone interested the various points of interest about the observatory.

EUCLID BEACH PARK, CLEVELAND, OHIO.

Calendar Years with Five Solar Eclipses

By ALEXANDER POGO

The problem of periodicity of calendar years with 7 eclipses is one of the simpler aspects of a more complex problem—the correlation between periodic celestial phenomena, on the one hand, and various systems of chronology, on the other. The chronological systems considered in the present paper are the Julian and the Gregorian calendars, extrapolated both into the past and into the future; we shall assume that the calendar year ends on December 31, at Greenwich mean midnight. Robert Schram's tables of the phases of the moon[1] were used for the computation of ecliptic syzygies preceding 1208 B.C. or following A.D. 2161, in other words, of syzygies falling outside the limits of Oppolzer's *Canon der Finsternisse*.[2]

Although the occurrence of 7 eclipses within 12 synodic months, or of 8 eclipses within 13½ nodical months, is relatively frequent, the occurrence of 7 eclipses between January 1 and December 31 is very rare. Calendar years with 7 eclipses belong to two types: years with 5 solar and 2 lunar eclipses, and years with 3 lunar and 4 solar eclipses. A calendar year with 5 solar eclipses always contains two total eclipses of the moon, one in January and the other in July; a year with 5 solar eclipses is, therefore, necessarily a 7-eclipse year. On the other hand, a year with 3 lunar eclipses may contain 4, or 3, or 2 solar eclipses;

[1] Kalendariographische und chronologische Tafeln. Leipzig 1908.
[2] Denkschriften d. Akademie, math.-naturwiss. Cl., Bd. 52, Wien 1887.

calendar years with 3 lunar eclipses will be discussed in a forthcoming paper.[3]

Since a year with 5 solar eclipses always contains, between December 21 and December 31, an eclipse of the sun by the umbra, the next year must have, in the first fortnight of January, a partial eclipse of the moon; years with 5 solar eclipses belong, therefore, to groups of 8 eclipses within $13\frac{1}{2}$ nodical months; their number is very limited, due to the condition that the 1st and 7th new moon of such a group of 8 eclipses should not occur earlier than January 1 nor later than December 31, respectively. The ecliptic syzygies of a 5-solar year must satisfy another condition, independent from the restrictions imposed by the calendar: in order to make possible 5 solar eclipses within 12 lunations, the first conjunction must occur east of the western major penumbral limit, the third conjunction—near the minor penumbral limit, west of the opposite node, and the fifth conjunction—east of the western major umbral limit. Since the introduction of the Gregorian reform, the calendar years 1805 and 1935 have met with the requirements imposed on years with 5 solar eclipses; see Table I and Figure 2.

The early-January eclipse of a 5-solar year occurs west of the node which is receding through the winter-solstice arc of the ecliptic; it belongs to a long penumbral terminal run closing a major or a hybrid solar saros series, Sn. Occasionally, the early-January eclipse falls on the closing date, P″, of the corresponding saros series; thus, the early-January eclipses of the Julian year —503 and of the Gregorian year 1935 coincided with the closing eclipses of series S175 and S1, respectively. On the other hand, the Julian years

—1024, —308, 213, 799, and 1320

failed to become calendar years with 5 solar eclipses, because the terminal runs of the hybrid saros series

S198, S134, S111, S223, and S200

were short, and no eclipses could, therefore, occur, early in January, in these years; on the diagram of Figure 1, these years form the lower fringe of circles. Table I shows that the shortness of the terminal run of the hybrid saros series S89 prevented the Gregorian year 1870 from becoming a year with 5 solar eclipses.

The late-January or early-February eclipse of a 5-solar year occurs to the east of the same node at which the early-January eclipse took place; due to the rapid motion of the earth in the perihelion arc, the longitude of the conjunction increases by about 30° between the 1st and the 2nd new moon; the westward motion of the node makes it possible for the moon to overtake the sun in the neighborhood of the eastern minor penumbral limit. The resulting eclipse belongs to the initial run of a major or hybrid saros series, S(n+1); although the initial run of

[3] The present paper is the fifth of a series dealing with eclipses; see the January, February, April, and June-July issues of Popular Astronomy, Vol. XLIII.

S(n+1) must begin before the end of the terminal run of Sn, a short penumbral run of a hybrid series may start too late to contribute a partial eclipse to a calendar year of the 5-solar type. Thus, because the short initial runs of the hybrid saros series

S217, S130, and S19

started too late, no late-January or early-February eclipses occurred in the Julian years

—698, 539, and 1125,

respectively; in the diagram of Figure 1, these years belong to the upper fringe of circles. Occasionally, a short run of a hybrid series begins just in time; thus the P′ eclipse of series S153 occurred on February 4, A.D. 18.

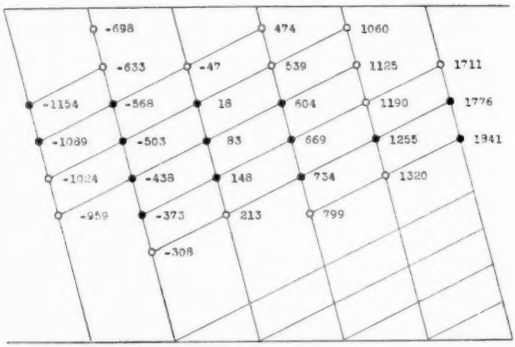

FIGURE 1.

JULIAN CALENDAR YEARS OF THE 5-SOLAR TYPE.

Dots represent years with 5 solar and 2 lunar eclipses.
Circles " " " 4 " " 2 " "

The late-June or early-July eclipse of a 5-solar year occurs west of the node which is receding through the summer-solstice arc of the ecliptic; it belongs to a short terminal run closing a pure or a hybrid minor series, S(n+6). Occasionally, the 3rd partial eclipse falls on the closing date, P″, of the corresponding minor saros series; thus, the early-July eclipses of the Julian years —438 and —373 occurred on the closing dates of series S93 and S5, respectively. On the other hand, the Julian year—959 remained a year with 4 solar eclipses, because the minor series S116 ended two saroses before the date of the 7th new moon of that year. On the diagram of Figure 1, the year —959 is represented by a circle belonging to the lower fringe.

The late-July or early-August eclipse of a 5-solar year occurs to the east of the node mentioned in the preceding paragraph; due to the slow motion of the earth in the aphelion arc, the longitude of the conjunction increases by about 28° between the 7th and the 8th new moon; the regression of the node makes it possible for the 8th new moon to occur

near the eastern minor penumbral limit. The 4th partial eclipse belongs to the initial run of a pure or hybrid minor series, S(n+7). The long initial penumbral runs of the hybrid saros series

S135, S24, S1, S113, S160, and S137

started in August; no early-August eclipse could, therefore, occur in the Julian years

—633, —47, 474, 1060, 1190, and 1711,

respectively; these years with 4 solar eclipses are represented, on the diagram of Figure 1, by circles belonging to the upper fringe.

The Gregorian year 1870, which had no early-January eclipse and whose late-July eclipse occurred on the opening date, P′, of the saros series S96, will suffice as an example of a calendar year with 4 solar

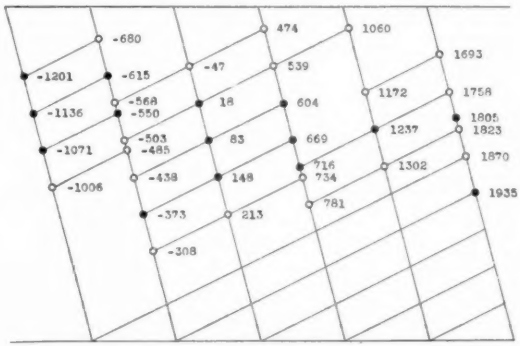

FIGURE 2.

GREGORIAN CALENDAR YEARS OF THE 5-SOLAR TYPE.

Dots represent years with 5 solar and 2 lunar eclipses.
Circles " " " 4 " " 2 " "

eclipses which contained either the P′ eclipse of S(n+1) or of S(n+7), or the P″ eclipse of Sn or of S(n+6).

The late-December eclipse of a 5-solar year occurs east of the major umbral limit, west of the node receding through the winter arc of the ecliptic; it belongs to the end of a long umbral run of a pure minor saros series, S(n+12). Late-December eclipses of ascending-node saros series occur, of course, in high southern latitudes; the Christmas eclipse of 1935 will be an eclipse of the midnight sun in the Antarctic; the December eclipses of the Julian years —373, 799, and 1320 were Antarctic midnight eclipses. In the case of descending-node saros series, the noon points of centrality of the late-December eclipses belong to a northern belt limited, roughly, by the latitudes 20° and 40°; on the corresponding exeligmos curves, these eclipses are located on the southernmost arcs of the loops, or near the southern ends of the cusps.

Now that we are familiar with the regions of the saros series where years with 5 solar eclipses may occur, we are ready for a survey of the

periodicity of these regions. Neither the saros nor the Metonic cycle may lead to the formation of sequences of calendar years with 5 solar eclipses: the former produces a violent shift of dates in the appropriate set of saros series, while the latter finds the appropriate dates in an unfavorable set of saros series. The saros plays, however, an important rôle in connecting Julian and Gregorian years of the 5-solar type, and in connecting Gregorian 5-solar sequences, as we shall see below. The importance of the saros in linking groups of years of the 5-solar type with groups of years of the 3-lunar type, and the rôle played by the Metonic cycle in the periodicity of years of the 3-lunar type, will be discussed in a forthcoming paper.

TABLE I

GREGORIAN CALENDAR YEARS OF THE 5-SOLAR TYPE

1693				1758				1823			
Jan. 6	p	S130	A	Jan. 9	p	S42	D	Jan. 12	p	S177	A
Jan. 22	t	L130	D	Jan. 24	t	L42	A	Jan. 26	t	L177	D
Feb. 5	p	S131	A	Feb. 8	p	S43	D	Feb. 11	p	S178	A
July 3	p	S136	D	July 5	p	S48	A	July 8	p	S183	D
July 17	t	L136	A	July 20	t	L48	D	July 23	t	L183	A
———		S137	D	———		S49	A	Aug. 6	p	S184	D
								1824			
Dec. 27	t	S142	A	Dec. 30	a	S54	D	Jan. 1	a	S189	A

1805				1870				1935			
Jan. 1	p	S177	A	———		S89	D	Jan. 5	(p)	S1	A
Jan. 15	t	L177	D	Jan. 17	t	L89	A	Jan. 19	t	L1	D
Jan. 30	p	S178	A	Jan. 31	p	S90	D	Feb. 3	p	S2	A
June 26	p	S183	D	June 28	p	S95	A	June 30	p	S7	D
July 11	t	L183	A	July 12	t	L95	D	July 16	t	L7	A
July 26	p	S184	D	July 28	p	S96	A	July 30	p	S8	D
Dec. 21	a	S189	A	Dec. 22	t	S101	D	Dec. 25	a	S13	A

The saros produces, in Julian as well as in Gregorian dates, a shift of 11 or 10 days, the former in the case of four leap-years, and the latter in the case of five leap-years between the two dates separated by a saros. Table I shows that the December eclipse of the Gregorian year 1805 is followed, at an interval of 18 years and 11 days, by the eclipse of 1824 January 1; the Gregorian year 1823 remained, therefore, a year with 4 solar and 2 lunar eclipses; on the other hand, the early-January eclipse of 1805 was preceded, at an interval of 18 years and 11 days, by the eclipse of 1786 December 20; the Gregorian year 1787 was a year with 3 lunar and 4 solar eclipses. It might be noticed, incidentally, that the New Year's eclipse of 1805 reached its maximum phase about one hour after Greenwich mean midnight of 1804 December 31; in Oppolzer's *Canon*, which introduced Universal Time, it is listed as the first eclipse of 1805, occurring on January 1, at $0^h\ 57^m$; in the

Nautical Almanac for 1804, it is listed as the last eclipse of 1804, occurring on December 31, at $12^h\ 51^m$; the *Nautical Almanac* for 1805 mentions but six eclipses, because Greenwich mean noon of 1805 January 1 was considered as the beginning of the year; the generally short duration of an early-January partial eclipse permits us to assume that even the beginning of the eclipse of 1805 January 1 occurred after Greenwich mean midnight. Similarly, the eclipse of 1824 January 1 is listed, in the *Nautical Almanac* for 1823, as the last eclipse of the year, occurring on December 31; the time of the conjunction is given as $20^h\ 7^m$; regardless of its duration, this annular eclipse must have started several hours after Greenwich midnight.

TABLE II
ECLIPSE CYCLES

Months	65 years (23742.6 days)	586 years (214037.7 days)
d	d	d
Synodical 29.530588	× 804 = 23742.59	× 7248 = 214037.70
Nodical 27.212220	× 872½ = 23742.66	× 7865½ = 214037.72
Anomalistic 27.554550	× 862 = 23752.02	× 7768 = 214043.74
Tropical 27.321582	× 869 = 23742.45	× 7834 = 214037.27
Sidereal 27.321661	× 869 = 23742.52	× 7834 = 214037.89
Years		
d	d	d
Ecl. (500 B.C.) ...346.61926	× 68½ = 23743.42	× 617½ = 214037.39
Ecl. (A.D. 1500) ..346.61990	× 68½ = 23743.46	× 617½ = 214037.79
Julian 365.25000	× 65 = 23741.25	× 586 = 214036.50
Gregorian 365.24250	× 65 = 23740.76	× 586 = 214032.10
Trop. (500 B.C.) .365.24235	× 65 = 23740.75	× 586 = 214032.01
Trop. (A.D. 1500) 365.24222	× 65 = 23740.74	× 586 = 214031.94
Sidereal 365.25636	× 65 = 23741.66	× 586 = 214040.23

Table II shows that, at intervals of about 23742 days, the members of the sun-earth-moon system return to relative positions which are similar in many respects; on the one hand, the earth returns, after 65 complete revolutions in its orbit, to its initial position, as far as the stars and the equinoxes are concerned, and to a symmetrical position with respect to the line joining the regressing nodes of the moon's orbit; on the other hand, the moon will be, after the lapse of about 23742 days, in its initial phase, and in about the same position, as far as the stars and the equinoxes are concerned, and it will be in a symmetrical position with respect to the line of nodes—but not to the line of apsides—of its orbit. While the earth describes 65 complete revolutions in its orbit, the line of nodes rotates about 3½ times; if we start with the ascending node at a given point of the ecliptic, we shall find, after the lapse of about 23742 days, the descending node less than 2° east of the original position of the ascending node, as far as the stars are concerned, and less than 3° east of the starting point, with respect to the equinoxes. If we take an ecliptic syzygy as the starting point of such an interval of

about 23742 days, we shall find an ecliptic syzygy at the end of the interval; in this manner, sequences of eclipses at alternating nodes may be obtained, with intervals of about 23742 days between the consecutive members of a sequence. The reader ought to keep in mind that the existence of these sequences is an intrinsic property of the sun-earth-moon eclipse mechanism, and is not affected by the chronological systems used in combining days into larger units such as months or years. The relation between the double Mec[4] and the interval of about 23742 days will be dealt with elsewhere. From the point of view of Old-World calendariography, a period of 65 years (804 lunations) is the difference between the Roman cycle of 84 years (1039 lunations) and the Metonic cycle of 19 years (235 lunations).

TABLE III

65-YEAR SEQUENCES OF SOLAR ECLIPSES

Julian Calendar									Gregorian Calendar			
—760 Nov 17	p	S129	A	670 Dec 18	a	S200	A		652 Dec 9	a	S200	
—695 Nov 19	p	41	D	735 Dec 19	a	112	D		717 Dec 11	a	112	
—630 Nov 21	p	176	A	800 Dec 19	t	24	A		782 Dec 13	t	24	
—565 Nov 21	p	88	D	865 Dec 21	a	159	D		847 Dec 15	a	159	
—500 Nov 23	p	223	A	930 Dec 22	a	71	A		912 Dec 16	a	71	
—435 Nov 24	p	135	D	995 Dec 24	t	206	D		977 Dec 18	t	206	
—370 Nov 25	p	47	A	1060 Dec 25	a	118	A		1042 Dec 21	a	118	
—305 Nov 28	p	182	D	1125 Dec 26	a	30	D		1107 Dec 23	a	30	
—240 Nov 28	p	94	A	1190 Dec 28	t	165	A		1172 Dec 24	t	165	
—175 Nov 29	a	6	D	1255 Dec 30	a	77	D		1237 Dec 26	a	77	
—110 Dec 1	t	141	A	1320 Dec 30	a	212	A		1302 Dec 28	a	212	
— 45 Dec 3	a	53	D	1386 Jan 1	t	124	D		1367 Dec 30	t	124	
20 Dec 3	at	188	A	1451 Jan 3	p	36	A		1432 Dec 31	(a)	36	
85 Dec 5	at	100	D	1516 Jan 4	p	171	D		1498 Jan 1	p	171	
150 Dec 6	a	12	A	1581 Jan 5	p	83	A		1563 Jan 4	p	83	
215 Dec 8	t	147	D	1646 Jan 6	p	218	D		1628 Jan 6	p	218	
280 Dec 9	a	59	A	1711 Jan 7	p	130	A		1693 Jan 6	p	130	
345 Dec 10	a	194	D	1776 Jan 10	p	42	D		1758 Jan 9	p	42	
410 Dec 12	t	106	A	1841 Jan 10	p	S177	A		1823 Jan 12	p	S177	
475 Dec 14	a	18	D									
540 Dec 14	a	153	A									
605 Dec 16	t	S65	D									

Table II shows that 804 lunations exceed 65 Julian years by more than one day, and 65 Gregorian years by almost two days; the gradually advancing dates of eclipses separated by 23742 or 23743 days are shown in the 65-year sequences of Table III. On the cylindrical diagram reproduced in the June-July issue, eclipses occurring at intervals of 65 years belong to steeply ascending spirals, and are separated by 3 saros windings (abscissae) plus 135 lunations (ordinates), or by 4 saros windings less 88 lunations; the eclipses of the Gregorian years 1805, 1870, and 1935 belong to such spirals; these years are marked by short vertical lines along the right side of the cylindrical diagram reproduced in the June-July issue. The successive eclipses of a 65-year sequence

[4] Maya eclipse cycle of 11960 days.

occur at alternating nodes, with the node halfway in its 4th westward revolution in the ecliptic, and the moon halfway in the 873rd nodical revolution in its orbit. Lunar eclipses form somewhat shorter 65-year sequences similar to those given in Table III; lunar sequences begin and end with runs of appulses and partial eclipses, the middle part being formed by a run of total eclipses; they will be dealt with in a forthcoming paper.

Among the periods based on the 65-year cycle, the following are especially important for the study of returns of groups of eclipses satisfying certain conditions:

586	years	= 8 × 65	+	66	years	= 32	saroses	+ 112	lunations
521	"	= 7 × 65	+	66	"	= 29	"	− 23	"
456	"	= 6 × 65	+	66	"	= 25	"	+ 65	"
391	"	= 5 × 65	+	66	"	= 22	"	− 70	"

From the point of view of years with 7 eclipses, the period of 586 years is almost as important as the 65-year cycle; in addition to the periods of 521, 456, and 391 years, derived from 586 by subtracting multiples of 65, we shall have to consider two periods involving 586 years and the saros:

1172	years =	2 × 586	years	= 65	saroses	+	1	lunation
568	" =	586 − 18	"	= 31	"	+ 112	"

Table II shows that 7248 lunations exceed 586 Julian years by one day and a few hours, while about 5½ days have to be added to 586 Gregorian years, in order to connect two eclipses separated by about 214038 days. It is therefore obvious that the 586-year period plays an important part in sequences of Julian years with 7 eclipses, while its role in the Gregorian calendar will be rather limited. Table IV offers an example of the slow progress, through the extrapolated Julian calendar, of a 586-year sequence of umbral eclipses, occurring at alternating nodes, and separated by about 214038 days. On the cylindrical diagram reproduced in the June-July issue, eclipses occurring at intervals of 586 years belong to steeply ascending spirals, and are separated by 32 saroses plus 112 lunations. A glance at the numbers of the saros series corresponding to the same node, in Table IV, shows that the 586-year sequence consists of eclipses belonging to two 1172-year sequences. On the cylindrical diagram reproduced in the June-July issue, eclipses separated by 14496 lunations belong to quasi-horizontal spirals, and are separated by 65 saroses in the direction of the abscissae, and by 1 lunation in the direction of the ordinates; since 14495 lunations form exactly 65 saroses, and since a solar saros series contains at least 70 eclipses, two 7-eclipse years separated by 1172 years must have one or two solar saros series in common, and any saros series which contains one eclipse belonging to a 7-eclipse year, must contain another eclipse, at an interval of 1172 years, which belongs to a year of the 7-eclipse type. The short vertical lines, in the pre-Gregorian part of the cylindrical diagram reproduced in the June-July issue, illustrate the 1172-year period of some

of the Julian years of the 5-solar type, as follows:

		−568	604	
−1089		83		1255
		−438	734	
−1154		18		1190
		−503	669	
−1024		148		1320

Before we leave the 586-year period, a few words ought to be said concerning the 568-year period. The shift of about $5\frac{1}{2}$ days, in the Gregorian calendar, corresponding to a 586-year period, may be offset by the shift of dates at an interval of one saros. Since $568 = 586 - 18$

TABLE IV

ECLIPSE SEQUENCES

d				d	
586 years (214037.7)			586 years	568 years (207452.4)	
1172 years (428075.4)					
Julian Calendar			Gregorian Calendar	Gregorian Calendar	
−2847 Dec 20	S185	A			
−2261 Dec 22	74	D			
−1675 Dec 23	186	A			
−1089 Dec 25	75	D	−1107 Dec 3	S75	−1034 Jan 16 S75
−503 Dec 25	187	A	−521 Dec 9	187	−466 Jan 11 187
83 Dec 27	76	D	65 Dec 14	76	102 Jan 5 76
669 Dec 28	188	A	651 Dec 21	188	669 Dec 31 188
1255 Dec 30	77	D	1237 Dec 26	77	1237 Dec 26 77
1841 Dec 30	S189	A	1824 Jan 1	S189	1805 Dec 21 189
					2373 Dec 15 S78

d					
521 years (190295.1)			521 years		
Julian Calendar			Gregorian Calendar		
−1024 Dec 25 Sunday	S210	A	130 Dec 17 Sunday	S211	A
−503 Dec 25 Sunday	187	A	651 Dec 21 Sunday	188	A
18 Dec 25 Sunday	164	A	1172 Dec 24 Sunday	165	A
539 Dec 26 Monday	141	A	1693 Dec 27 Sunday	142	A
1060 Dec 25 Monday	118	A	2215 Jan 1 Sunday	S119	A
1581 Dec 25 Monday	95	A			
2102 Dec 25 Monday	S72	A			

Gregorian years exceed 7025 lunations by about $5\frac{1}{2}$ days, the Gregorian dates of eclipses separated by about 207452 days will recede at the same rate at which the Gregorian dates of eclipses separated by about 214038 days progress; by alternating, therefore, two or three eclipses of 568-year sequences with correspondingly short groups of 586-year sequences, it is possible to form relatively long Gregorian sequences satisfying the conditions imposed on 5-solar years; see Table IV and Figure 2. The discrepancy of almost 10 days between 568 Julian years and 7025 lunations renders the period of 568 years valueless, as far as Julian years of the 5-solar type are concerned.

The period of 521 years plays an important role in the formation of sequences of exeligmos curves; it will be discussed elsewhere, in con-

nection with the position of the nodes with respect to perigee and perihelion. Since the difference between 521 Julian years and 6444 lunations amounts to but a few hours, eclipses occurring at intervals of about 190295 days fall, in the Julian calendar, on about the same date—a situation similar to that encountered in the case of the Metonic cycle of 19 years; in the case of the Gregorian calendar, the difference between 6444 lunations and 521 years amounts to almost 4 days, and the rôle of the 521-year period is, therefore, limited, as far as years with 7 eclipses are concerned. It might be noticed, incidentally, that 190295 is a multiple of 7; eclipses separated by 190295 days fall, therefore, on the same day of the week. Table IV offers an example of an ascending-node 521-year sequence of solar eclipses falling on Sundays and Mondays, dated December 25 or 26, and running through three millennia of the extrapolated Julian calendar; the other ascending-node 521-year sequence of Sunday eclipses shows a half-month shift of dates within two millennia of the extrapolated Gregorian calendar. On the cylindrical diagram reproduced in the June-July issue, eclipses occurring at intervals of 521 years belong to ascending spirals, and are separated by 28 saroses plus 200 lunations, or by 29 saroses minus 23 lunations.

The hexa-Callippic cycle[5] of 456 years will be discussed in a forthcoming paper, in connection with calendar years having 3 lunar eclipses; it plays, in the Gregorian calendar, a rôle comparable to that of the 586-year period in the Julian calendar. In the diagrams of Figures 1 and 2, the hexa-Callippic cycle is illustrated by such sequences as —308, 148, 604, and 1060. The hexa-Callippic cycle exceeds $24\frac{1}{2}$ tropical regression periods of the node by less than two days; eclipses separated by $16655\frac{2}{2}$ days are, therefore, characterized by returns of the alternating nodes to the same longitude.

Now that we are familiar with the periods contributing to the formation of years with 5 solar eclipses, let us inspect the patterns formed by these years. Let us assume that successive Julian years of the 5-solar type are marked, on a string, by knots or beads separated by intervals corresponding to 65 years; let us wind this string around a horizontal cylinder in such a manner that the pitch of the spirals should correspond to 586 years; see the cylindrical diagram reproduced in Figure 1. The Julian string could be wound around other cylinders, in spirals corresponding, for instance, to 651, or 521, or 456 years; the reasons for preferring 586-year spirals, and for cutting them along the horizontal line corresponding—at the top and at the bottom of the diagram—to the 3-lunar years —735, —149, 437, 1023, and 1609, will be given in a forthcoming paper. The diagram of Figure 1 shows the simple pattern formed by the Julian 5-solar years, a network of descending 65-year spirals and of ascending 521-year spirals. The 65-year sequence given

[5] The Callippic cycle of 76 years (940 lunations) is based on the Metonic cycle of 19 years (235 lunations). The hexa-Callippic cycle of 456 years (5640 lunations) is, therefore, based both on the Callippic and on the Metonic cycles.

in Table III contains the December eclipses of the years marked on the 5th spiral, as well as the January eclipses of the years marked on the 6th spiral of the diagram of Figure 1; the December eclipses (474 Dec. 24 to 799 Dec. 31) of the years marked on the 4th spiral, and the January eclipses (1060 Jan. 6 to 1255 Jan. 10) of the years shown on the 5th spiral, belong to the second half of another 65-year sequence, and so on. Calendar years like 1906, having no ecliptic syzygies in December, are not shown on the diagram of Figure 1.

Let us now assume that the successive Gregorian years of the 5-solar type are similarly marked on another string which is wound around a horizontal cylinder in spirals having a pitch of 586 years; see the cylindrical diagram of Figure 2. If we follow the direction of the horizontal axis, we find that short 586-year sequences, such as —503, 83, and 669, alternate with short slowly-ascending 568-year sequences, such as 669,

TABLE V

ECLIPTIC SYZYGIES OF THE GREGORIAN YEAR 2391

J.D. 2594	A.D. 2391 Gregorian	Saros series	Node	Ecl. of series	Type of eclipse
369.7	Jan. 6.2	S66	D	79th	penumbral still possible
375.0	Jan. 21.5	L66	A	25th	total
389.5	Feb. 4.9	S67	D	≤13th	penumbral
537.6	July 3.1	S72	A	66th	penumbral
551.6	July 17.1	L72	D	14th	total
566.6	Aug. 1.1	S73	A	≤ 5th	penumbral already possible
713.6	Dec. 26.1	S78	D	52nd	umbral

1237, and 1805. The corresponding saros shift of the 65-year sequences is clearly visible, if we follow the descending spirals formed by the successive Gregorian years of the 5-solar type. The 521-year diagonals passing through 1693 and 1805 shall now be used for the purpose of locating the Gregorian years of the 5-solar type of future centuries.

The 65-year sequence formed by the Gregorian years 2149, 2214, and 2279, begins and ends with years which are easily disposed of: there will be but 3 solar eclipses in 2149, and there will be no December eclipse in 2279. The case of the year 2214 is similar to the case of 1823. Table IV shows that the 521-year sequence of Sunday eclipses leads to the umbral eclipse of 2215 January 1; this eclipse is scheduled to occur shortly after Greenwich mean midnight of Saturday, December 31; unlike the New Year's eclipse of 1824, the New Year's eclipse of 2215 will begin long before Greenwich midnight, and a slight change in the elements could bring the computed conjunction within the last minutes of Saturday, December 31, 2214. The eclipse of February 10, 2214, is both possible and probable; on the other hand, it is possible but improbable that series S114 should start early enough to provide the eclipse of August 6, 2214.

The 65-year sequence formed by the Gregorian years 2196, 2261,

2326, 2391, and 2456, is more likely to furnish one or two years with 5 solar eclipses. The year 2196, preceding 2214 by one saros, will have no early-January eclipse, on account of the ecliptic syzygy of 2195 December 31; the new moon is scheduled to occur before Greenwich mean noon of December 31, and a shift across the midnight line is, therefore, impossible. The years 2261 and 2326 could, theoretically, be years with 5 solar eclipses, but it is improbable that the saros series S26 and S161 will start early enough to provide partial eclipses on July 28 and on July 30, respectively. Table V gives the ecliptic syzygies of the Gregorian year 2391. If S66 is a major series, the eclipse of January 6 will take place; if series S73 starts early enough, the eclipse of August 1 will take place; if this double condition is satisfied, the year 2391 will become the third Gregorian year with 5 solar eclipses since the introduction of the calendar reform; otherwise, the year 2456 would be the next to be considered. The Gregorian years 1805 and 2391 may, therefore, be the first two members of a short horizontal 586-year sequence connected, by the slowly-ascending 568-year sequence 669, 1237, and 1805, with the 586-year sequence −503, 83, and 669. The period of 521 years connects 2391 with 1870, and the hexa-Callippic period of 456 years, with the current 5-solar year, 1935.

CARNEGIE INSTITUTION OF WASHINGTON,
MARCH 27, 1935.

Photography with a Small Reflector

By JOSEPH L. WOODS and PAUL S. WATSON

Making presentable photographs with a small reflector that was not designed for such work by the maker, is no easy task but, for anyone with plenty of perseverance and who is pretty good at tinkering, the difficulties are not insurmountable and the rewards of success are very much worth while.

A reflecting telescope with aluminized mirrors will, with an exposure of 15 minutes on a fast plate, record stars as faint as can be seen at the eyepiece and, with longer exposures, things come to light the existence of which would not be guessed from visual observations with the same instrument.

The photograph of the open star cluster, M 35 in Gemini, which is reproduced here, was made with a 12-inch Newtonian reflector of 61 inches focus; with an exposure of 30 minutes on an "Eastman 50" plate. This cluster is coarse enough and bright enough to make a beautiful object in even the smallest telescope. There is a very small faint cluster (N.G.C. 2158) in the field near the southwestern edge.

The photograph of M 46, in Puppis, was exposed for 35 minutes on the same kind of plate, and with the same instrument. As may be seen, this cluster is more compressed than the other, and is composed of

fainter stars. In very small telescopes this object appears nebulous, and is quite faint. Near the northern edge of the cluster there is a small round nebula, N.G.C. 2438. In the original negative its annular shape is very apparent and several stars may be seen within it. It is like a very small copy of the ring nebula in Lyra. Visually, this nebula appears in the 12-inch reflector as a small, faint, luminous disc without de-

FIGURE 1.
MESSIER 35, IN GEMINI.
(Photograph by Woods and Watson)

tail, and it is only under the best conditions that the brightest star in it can be seen.

The field of each of these photographs is, on the original negative, a circle 1 5/32 inches in diameter. This represents a circle of sky very nearly 1° 5′ in diameter. In making the enlarged prints from which these reproductions were made, the fields were cut down to a little less than a degree.

When we made our first attempt at photography with the 12-inch reflector, we did our guiding with a 4-inch refractor of short focus,

attached to the tube of the larger instrument.

As we could not use any star fainter than the 6th magnitude for guiding purposes, we had to provide means for adjusting the angle between the two optical systems so that the reflector would point to the field to be photographed, while the guiding telescope was directed toward a star bright enough for our purpose. This involved consider-

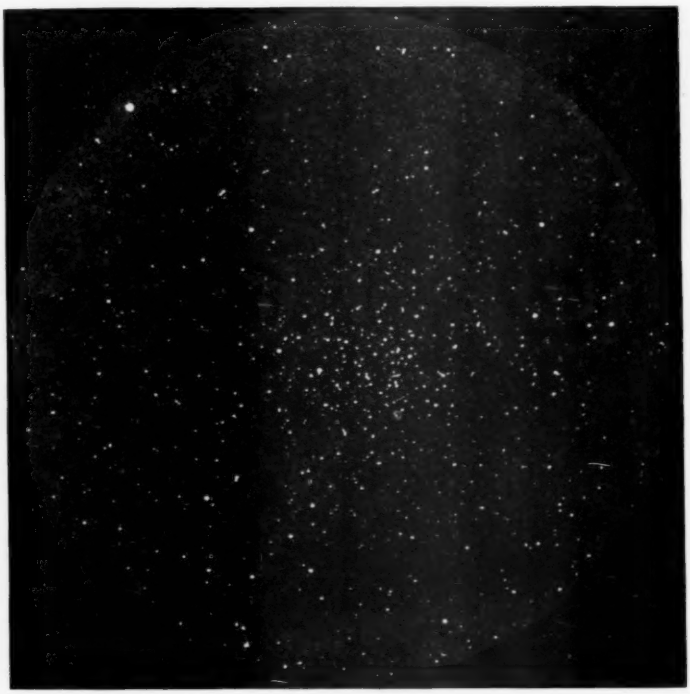

FIGURE 2.
MESSIER 46, IN PUPPIS.
(Photograph by Woods and Watson)

able mechanical difficulty, but we finally devised a way of providing for the necessary adjustment and clamping the two telescopes firmly together.

We had not made many trial exposures, in this way, before it became apparent that things were going wrong in the reflector that could not be detected by the photographer while watching the star in the guiding telescope. In all our early attempts, good star images seemed to be a matter of chance, and very poor chance at that. They were elongated in various directions and some were in the form of short arcs that sug-

gested lima beans. We never did find the exact cause of the difficulty, but we concluded it arose from several causes, such as flexure in either one, or both, of the tubes, or, even more likely, some slight shifting of the mirrors which are, of necessity, fitted rather loosely in their cells. When we had, at last, assured ourselves that bad guiding was not responsible for our failures, we removed the refractor and provided, instead, a device similar to the double-slide plate holder that is used on practically all the large instruments that are devoted to photographic work. Our device, however, has no slides; the guiding being done by moving the entire instrument, as before. This present arrangement consists of a circular plate carrying the plate holder and an eyepiece, as close together as possible. There is provision for some adjustment of the eyepiece to or from the center of the plate and the whole device may be rotated about this center. This gives an annular band of sky (with the field of the photograph in the middle) from which a star may be selected for guiding. We have found we can use a star as faint as the 9th magnitude for this purpose and, so far, there has always been one as bright as this, or brighter, within this area. As the guiding eyepiece is rather far from the optical axis of the mirrors, the image of the guide star is somewhat distorted, but this does not trouble us greatly.

The advantage of this method of guiding, over one that involves the use of a separate optical system, lies in the fact that any derangement of the mirrors or mechanical parts, that would cause the image to shift on the photographic plate, would cause a similar displacement of the star in the guiding eyepiece; and the trouble could be corrected immediately.

We have tried reticules of various forms and materials, and have finally settled down to the use of a square formed of four thin white hairs from the soft fluffy part of the tail of a Persian cat. The width of this square is 1/100th of an inch. The focal length of the mirror being 61 inches, the square includes a portion of the sky which is 33.8 seconds of arc in width. The angular diameter of the photographic image of a faint star on one of our average plates is about 10 seconds of arc, so it is evident that the guide star must be kept fairly close to the center of the square, or elongated images will result. If the photographer is in a comfortable position, and not too cold or sleepy, this is not a very difficult task. The reticule is illuminated by a flash light bulb which is controlled by a rheostat. The photographer sees the minute luminous square magnified by the full power of the guiding eyepiece which is, in this case, a compound microscope magnifying 30 times.

There is, of course, the usual mechanical slow motion in declination but, with the polar axis in good alignment, there is very little guiding to be done in this direction. Adjustment in right ascension is accomplished by accelerating, or momentarily stopping, the electric driving clock. The latter has a fly-ball governor which, when the proper speed has been attained, tends to separate two carbon contacts, thus decreasing or interrupting the flow of current to a small fan motor which fur-

nishes the motive power. This clock is not absolutely synchronous, even in theory, but its rate is easily adjusted and it may be controlled very conveniently, in guiding, by means of a switch having two push buttons; one for slowing the motor by breaking the circuit momentarily; the other for accelerating its motion by giving it the full current, regardless of the position of the governor. These two push buttons are contained in a sort of handle which is connected to the clock by a flexible cord of three wires. This contrivance, together with the hand that operates it, may be kept in the photographer's overcoat pocket on cold nights.

The mirrors of our telescope were figured by J. W. Fecker; the equatorial, clock, and other mechanical parts are, in a sense, homemade, having been built in the machine shop of a manufacturing plant operated (when his attention is not too much engaged in astronomical matters) by one of the authors.

The telescope is permanently housed twenty-eight miles from the smoke and lights of Baltimore, in a small house the four walls and roof of which revolve upon a circular track on the floor. There is a hinged door in the roof, four feet wide, and another in one of the walls, through which the instrument may be pointed to any part of the sky.

The owner of an equipment such as this will find that there is a great deal of useful work well within its scope, work that should be done, but for which the great telescopes have no time.

4102 Westview Road, Baltimore, Md., April 14, 1935.

Planet Notes for September and October, 1935

By CLIFFORD E. SMITH

Note: All times are Central Standard Time unless otherwise stated.

The *Sun* will be moving with a southeasterly motion from the central part of Leo to the extreme eastern part of Virgo. Its distance from the earth will decrease from about 93.8 to about 92.2 million miles. On September 23 at 6:00 P.M. the sun will be at the Autumnal Equinox which marks the beginning of spring in the southern hemisphere and of fall in the northern hemisphere. The position of the sun on September 1, October 1, and October 31 will be, respectively: R.A. $10^h\ 37^m$, Decl. $+8°\ 43'$; R.A. $12^h\ 25^m$, Decl. $-2°\ 44'$; and R.A. $14^h\ 17^m$, Decl. $-13°\ 44'$.

The phenomena of the *Moon* will occur as follows:

First Quarter	Sept.	5	at	8 P.M.
Full Moon		12	"	2 P.M.
Last Quarter		19	"	8 A.M.
New Moon		27	"	11 A.M.
First Quarter	Oct.	5	"	8 A.M.
Full Moon		11	"	11 P.M.
Last Quarter		18	"	12 P.M.
New Moon		27	"	4 A.M.
Perigee	Sept.	12	"	12 M.
"	Oct.	10	"	11 P.M.
Apogee	Sept.	25	"	11 P.M.
"	Oct.	23	"	7 A.M.

Mercury, during September, will be an evening star in Virgo, setting about an

hour after the sun. Greatest elongation east will occur at 5:00 A.M. on September 23 (26°3). During the middle of October, Mercury will not be in a position favorable for observation since inferior conjunction will occur on October 17 at 11:00 P.M. By the end of October, Mercury will be a morning star rising about an hour before the sun. Conjunction with the moon will occur on September 29 at 7:00 P.M. (Mercury 1°6 N), and again on October 26. The distance from Mercury to the earth will decrease from about 118 million miles to about 62 million miles on about October 17 and back again to about 84 million miles by the end of October. The corresponding change in apparent diameter will be from about 5.3 to about 10.1 and back again to about 7.4 seconds of arc. The position of Mercury on September 1, October 1, and October 31 will be, respectively: R.A. 11^h 47^m, Decl. $+1°$ 40′; R.A. 13^h 52^m, Decl. $-15°$ 11′, and R.A. 13^h 11^m, Decl. $-5°$ 27′.

Venus will be near the border of the constellations Leo and Virgo. Inferior conjunction will occur on September 8 at 2:00 A.M. Its distance from the earth will increase from about 275 to about 500 million miles, and its apparent diameter will decrease from about 57.3 to about 31 seconds of arc. During October, Venus will be a morning star rising from two to three hours before the sun. Conjunction with the moon will occur on September 25 at 3:00 A.M. (Venus 3°5 S), and on October 23 at 8:00 A.M. (Venus 3°0 N). On October 15, Venus will be at its greatest brilliancy for this period as a morning star. On October 24 at 7:00 P.M. Venus will be in conjunction with Neptune (Venus 2°6 S).

Mars will be an evening star, setting from three to four hours after the sun. Its apparent motion among the stars will be easterly from central Libra, across Scorpio and Ophiuchus, to western Sagittarius. Its distance from the earth will increase from about 130 to about 160 million miles, and its apparent diameter will decrease from about 6.7 to about 5.5 seconds of arc. Conjunction with the moon will occur on September 4 at 7:00 A.M. (Mars 3°1 N), and on October 3 at 1:00 A.M. (Mars 1°6 N).

Jupiter will be an evening star in eastern Libra. At the beginning of September it will set about four hours after the sun, but by the end of October it will set only about an hour after the sun. Its distance from the earth will be about 550 million miles, and its apparent diameter will be about 30 seconds of arc. Conjunction with the moon will occur on September 3 at midnight (Jupiter 5°6 N), on October 1 at 2:00 P.M. (Jupiter 5°0 N), and on October 29 at 6:00 A.M. (Jupiter 4°5 N).

Saturn will be a night object in central Aquarius. During the middle of this period it will be on the meridian about 10:00 P.M., local time. Its distance from the earth will be about 825 million miles, and its apparent diameter will be about 17 seconds of arc. Conjunction with the moon will occur on September 11 at 9:00 P.M. (Saturn 6°1 S), and on October 9 at 5:00 A.M. (Saturn 6°1 S).

Uranus will be a night object in southwestern Aries. It will be above the horizon most of the night hours since opposition with respect to the sun will occur on October 27 at 3:00 P.M. Its distance from the earth will be about 1760 million miles, and its apparent diameter will be about 3¾ seconds of arc. Conjunction with the moon will occur on September 15 at 7:00 P.M. (Uranus 5°7 S), and on October 13 at 4:00 A.M. (Uranus 5°6 S).

Neptune will continue in Leo near χ Leonis. During September it will be too near the sun, in apparent position, to be of interest, since conjunction with the sun will occur on September 7 at 4:00 P.M. By the end of October, however, it will be a morning star rising about three hours before the sun. Its distance from the

earth will be about 2900 million miles, and its apparent diameter will be about 2⅛ seconds of arc. On October 23 Neptune will be in conjunction with the moon (Neptune 5°8 N), and on October 24 at 7:00 P.M. it will be in conjunction with Venus (Neptune 2°6 N).

OCCULTATIONS VISIBLE AT WASHINGTON

(Taken from the *American Ephemeris.*)

The quantities in the columns *a* and *b* are given for the purpose of making these predictions useful for any place within 200 miles of the point indicated. The procedure is as follows: Subtract the longitude of the point given from the longitude of the place in question; multiply the result, taking the signs into account, by the quantity under *a* for the star to be observed; similarly, with the latitude, using *b*; apply the sum of the products, with its proper sign, to the Greenwich C.T., and obtain the predicted Greenwich Civil Time for the phenomenon at the place of observation. To obtain Eastern Standard Time it is necessary to subtract five hours; Central Standard Time, six hours, etc.

Date 1935		Star	Mag.	IMMERSION Greenwich C.T.	*a*	*b*	Angle E from N	EMERSION Greenwich C.T.	*a*	*b*	Angle E from N
				h m	m	m	°	h m	m	m	°
Sept.	8	126 B.Sgr	5.8	2 56.0	−2.8	−2.5	129	3 33.9	+0.4	+1.8	192
	11	186 B.Aqr	6.2	22 50.2	−0.2	+1.0	102	23 35.7	−0.5	+2.2	207
	13	16 Psc	5.6	5 2.2	..	..	342	5 25.6	..	..	305
	13	19 Psc	5.3	10 19.8	−0.3	+0.4	41	11 11.0	−0.1	−1.1	267
	14	136 B.Psc	6.5	9 40.7	−1.5	−4.2	128	10 10.2	−0.5	+3.8	180
	17	66 Ari	6.1	5 0.4	−0.2	+2.3	44	6 1.9	−1.4	+0.9	273
	18	62 Tau	6.2	3 12.3	0.0	+0.8	109	3 57.9	+0.4	+2.0	224
	19	118 Tau	5.4	6 2.9	−0.7	+1.0	101	7 7.2	−0.6	+1.9	243
	21	δ Gem	3.5	6 21.7	−0.1	+1.0	101	7 23.7	−0.4	+1.3	268
	21	149 B.Gem	6.4	10 36.3	..	..	168	11 16.5	..	..	220
Oct.	4	67 B.Sgr	6.4	22 46.4	−2.3	−0.4	105	0 1.2	−1.4	+0.3	230
	7	σ Cap	5.5	1 40.7	−1.8	−0.3	80	2 50.7	−0.8	+0.4	222
	13	47 B.Ari	6.5	9 7.1	..	..	346	9 10.5	..	..	337
	14	47 Ari	5.8	2 32.4	−1.1	+0.9	103	3 23.1	−0.2	+2.6	209
	15	36 Tau	5.7	5 7.2	−0.9	+2.3	51	6 17.4	−2.0	+0.3	276
	16	315 B.Tau	6.3	1 6.0	+0.4	+0.8	98	1 54.4	+0.4	+1.5	243
	17	5 Gem	5.9	8 49.5	−2.1	−0.8	114	10 15.0	−2.3	+0.1	262
	18	44 Gem	5.9	7 17.2	−1.4	+1.2	90	8 38.9	−1.9	0.0	288
	19	85 Gem	5.4	6 15.0	+0.1	+3.6	47	6 56.4	−1.4	−1.8	334
	20	54 Cnc	6.3	10 8.1	−2.0	+0.1	107	11 35.6	−1.8	−1.5	309
	21	ξ Leo	5.1	6 52.2	−0.3	−0.2	134	7 51.7	−0.5	+1.5	265

Variable Stars

Monthly Report of the American Association of Variable Star Observers for May and June, 1935

Nova Herculis has staged a comeback. It remained at the thirteenth magnitude for a short time only, and its rise to above the eighth magnitude has been remarkably steady, somewhat more rapid at the beginning of the rise than at the latter part. Will it reach naked eye visibility? Probably not. Time only will tell, so it behooves us all to keep it on our observing lists. More than six thousand observations have been collected from all sources by the Recorder. Observations have been obtained on every night, since discovery, up until June 8.

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

March 0 = J.D. 2427862; April 0 = J.D. 2427893; May 0 = J.D. 2427923.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
V SCL			Y CEP			U SCL			X CAS			T PER			R CET		
000339			003179			*010630*			014958			021258			*022000*		
869	11.0	Bl	870	10.6	Ch	889[	12.0	Bl	913	10.2	Pt	926	8.7	Ra	864	8.0	Ch
883	10.6	Bl	884	10.8	Ch	U AND			918	11.5	Jo	931	9.1	Hm	886	9.8	Ch
889	10.5	Bl	895	11.1	Br	010940			U PER			934	9.1	Hm	RR PER		
896	9.7	Bl	895	11.5	Pb	864	13.2	Ch	015254			934	9.2	Dl	022150		
SS CAS			928	13.2	Br	963[	12.1	Gy	864	8.6	Ch	934	8.9	Cm	864	10.8	Ch
000451			944[	12.9	Gy	UZ AND			893	8.7	Fc	955	8.5	Jo	913[	13.2	Pt
947	10.4	Gy	U CAS			011041			886	8.9	Fc	967	9.1	Kg	R FOR		
948	10.2	Ar	004047a			864	12.8	Ch	889	8.6	Fc	Z CEP			*022426*		
961	12.0	Jo	864[	13.3	Ch	S CAS			891	8.7	Fc	021281			869	11.3	Bl
963	11.0	Gy	955[	12.1	Wd	011272			896	8.6	Ry	884[	11.8	Ch	883	10.8	Bl
X AND			RW AND			864	11.9	Ch	898	8.5	Fc	895	13.9	Br	889	10.8	Bl
001046			004132			883	10.1	Fc	903	8.5	Fc	913[	12.5	Pt	896	11.1	Bl
864	9.0	Ch	864[	13.1	Ch	884	9.8	Ch	903	8.5	Ry	929	11.7	Br	917	9.8	Bl
934	11.6	Cm	RX CEP			886	9.9	Fc	903	8.4	Jo	944	11.6	Gy	U CET		
T AND			004281			891	9.6	Fc	907	8.4	Fc	o CET			*023813*		
001726			906	7.4	Lt	898	9.4	Fc	909	8.4	Fc	*021403*			875	8.5	Ch
864	11.3	Ch	V AND			903	9.0	Fc	911	8.4	Hf	774	3.8	Lu	RR CEP		
952[	12.0	Gy	004435			903	9.0	Jo	913	8.6	Pt	783	3.7	Lu	022980		
T CAS			864	11.5	Ch	904	9.3	Fc	915	8.5	Ry	863	4.6	Ch	870	10.2	Ch
001755			X SCL			905	9.3	Fc	918	8.3	Jo	868	5.0	Ch	884	9.8	Ch
864	11.8	Ch	*004435*			906	9.1	Fc	918	8.7	Cm	874	5.2	Ch	895	9.7	Br
903	12.2	Jo	869	11.7	Bl	906	8.7	Pf	918	8.5	Dl	884	5.7	Ch	898	9.7	Fc
918	12.0	Jo	889[	12.1	Bl	907	9.2	Fc	919	8.3	Rv	SU PER			903	9.7	Fc
924	11.9	Jo	RR AND			909	9.1	Fc	923	8.4	Ry	021556b			905	9.8	Fc
927	12.0	Jo	004533			910	8.9	Fc	927	8.0	Ry	857	8.1	Lt	907	9.9	Fc
934	11.2	Cm	864[	13.3	Ch	911	9.1	Hf	931	7.8	Ry	890	8.0	Lt	909	10.1	Fc
938	11.6	Gy	RV CAS			913	9.0	Pt	931	8.5	Hm	825	8.0	Lt	910	10.1	Fc
947	11.1	Gy	004746a			918	8.7	Jo	933	7.8	Ry	S PER			913	10.6	Pt
951	9.0	Mc	864[	13.3	Ch	921	8.9	Jo	934	8.4	Hm	021558			929	11.3	Br
955	11.0	Wd	963[	12.9	Gy	927	9.3	Jo	955	7.8	Jo	774	9.6	Lu	944	11.6	Gy
956	11.7	Jo	—	CAS		934	9.6	Cm	961	7.7	Jo	783	9.6	Lu	R TRI		
961	11.8	Jo	004746b			935	8.8	Jo	XX PER			883	9.6	Fc	023133		
963	11.1	Gy	934	10.9	Cm	937	8.8	Jo	015654			886	9.7	Fc	864	6.2	Ch
R AND			W CAS			948	8.8	Hf	864	8.1	Ch	889	9.4	Fc	875	6.2	Ch
001838			004958			956	9.4	Jo	925	8.4	Lt	891	9.5	Fc	888	6.9	Ch
864	13.4	Ch	864	10.2	Ch	RZ PER			RV AND			898	9.3	Fc	895	6.8	Ah
926	10.0	Ah	899	10.0	Dh	012350			020448			901	9.4	Fc	903	8.2	Jo
931	9.6	Ah	903	9.5	Jo	864	12.6	Ch	955	10.4	Wp	903	9.4	Fc	912	6.6	Hm
932	9.6	Ah	913	9.4	Pt	RU AND			955	11.8	Fa	903	8.9	Jo	913	6.7	Hm
933	9.6	Cm	917	9.4	Cm	013238			R ARI			907	9.3	Fc	TX PER		
944	8.5	Ah	918	9.3	Jo	864	12.9	Ch	021024			909	9.2	Fc	024136		
948	8.1	Hf	924	9.0	Jo	Y AND			864	8.4	Ch	910	9.3	Fc	963	11.0	Gy
950	7.4	Ah	927	9.2	Jo	013338			875	8.7	Ch	911	9.3	Hf	T ARI		
956	7.5	Jo	940	9.4	Dh	864	9.1	Ch	883	9.0	Fc	912	9.3	Sz	024217		
961	6.9	Jo	941	9.4	Dh	963[	11.5	Gy	W AND			913	8.9	Pt	864	8.6	Ch
S TUC			941	9.2	Pb	X CAS			021143a			914	9.3	Lf	883	8.8	Fc
001862			948	9.4	Hf	014958			864	12.0	Ch	918	9.1	Dl	W PER		
889[	13.2	Bl	955	9.6	Wd	883	10.8	Fc	T PER			920	9.0	Jo	024356		
901	13.3	Ht	956	9.3	Jo	886	10.9	Fc	021258			924	9.1	Jo	864	9.0	Ch
917	10.5	Bl	961	9.4	Jo	891	10.9	Fc	774	8.9	Lu	926	9.3	Ra	882	9.2	Ch
T PHE			U TUC			898	10.8	Fc	783	9.1	Lu	931	9.3	Hm	883	9.1	Fc
002546			*005475*			903	10.9	Fc	903	8.5	Jo	932	9.3	Md	891	9.3	Fc
869	10.6	Bl	889	14.0	Bl	903	11.7	Jo	911	8.9	Hf	934	9.3	Hm	896	9.5	Ry
883	11.6	Bl	896	13.7	Bl	906	10.3	Fc	913	8.6	Pt	934	9.0	Dl	896	9.4	Hv
889	12.0	Bl	916	13.2	Ht	907	10.3	Fc	918	9.2	Dl	934	9.1	Cm	898	9.4	Fc
901[	13.0	Ht	917	13.1	Bl	909	10.2	Fc	920	8.6	Jo	955	9.4	Jo	899	9.4	Hv
						910	10.3	Fc	924	8.5	Jo	967	9.3	Kg	901	10.1	Fc

Variable Star Observations Received During May and June, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
W Per			**T Hor**			Nov Per			R Tau			X Cam			V Tau		
024356			*025751*			032443			042209			043274			044617		
903	9.8	Fc	896	10.5	Bl	868	13.2	Ch	913	11.6	Pt	946	10.5	Kn	864	12.7	Ch
903	9.9	Ry	898	10.9	Ht	913	13.2	Pt	W Tau			946	10.7	Hf	898	13.0	Ch
903	9.5	Jo	905	11.1	Ht	U Cam			042215			947	10.6	Hf	AB Aur		
905	9.4	Fc	916	12.2	Ht	033362			864	11.1	Ch	947	10.5	Wp	044930		
906	9.0	Fc	917	12.3	Bl	884	7.5	Ks	883	10.5	Fc	947	10.3	Wa	906	6.9	Lt
907	9.4	Fc	U Ari			903	7.6	Jo	884	10.6	Fc	949	10.2	Hf	R Ori		
909	9.4	Fc	030514			911	8.3	Hf	901	10.2	Hu	953	10.0	Hf	045307		
910	9.1	Fc	864	14.0	Ch	912	8.9	Hm	903	10.5	Fc	953	10.1	Wp	869	9.9	Ch
911	9.4	Hf	869	13.8	Ch	913	8.9	Hm	906	10.3	Fc	955	9.6	Hf	884	10.6	Fc
912	9.3	Hm	X Cet			918	7.7	Jo	907	10.2	Fc	R Dor			885	10.1	Ch
913	9.4	Hm	*031401*			918	8.4	Hf	909	10.1	Fc	*043562*			889	10.9	Fc
913	9.5	Mc	868	11.0	Ch	918	8.5	Sh	913	10.2	Pt	869	6.1	Bl	891	10.8	Fc
913	9.4	Hv	Y Per			924	7.6	Jo	S Tau			883	6.1	Bl	906	11.1	Fc
913	10.0	Pt	032043			931	7.6	Jo	042309			889	6.0	Bl	907	11.1	Fc
913	9.3	Bc	864	8.3	Ch	931	8.8	Hm	864[	13.0	Ch	891	5.8	En	909	11.1	Fc
914	9.5	Hv	882	9.4	Ch	932	8.8	Hm	913[	12.0	Pt	892	5.4	Ht	R Lep		
915	9.3	Hv	883	9.4	Fc	934	8.8	Hm	T Cam			895	5.6	En	*045514*		
915	9.3	Bc	884	8.8	Ks	934	8.2	Hf	043065			896	6.0	Bl	774	8.3	Lu
915	10.0	Ry	886	9.6	Fc	935	7.4	Jo	868	12.3	Ch	898	5.5	Ht	869	9.0	Ch
918	9.5	Dl	889	9.6	Fc	937	7.5	Jo	884	13.2	Ks	905	5.5	Ht	882	9.4	Ch
918	9.5	Jo	891	9.6	Fc	942	8.5	Hf	913[	12.0	Pt	915	5.5	En	V Ori		
919	10.0	Ry	895	9.8	Ah	943	7.7	Jo	RX Tau			916	5.5	Ht	050003		
923	10.0	Ry	896	9.5	Hv	945	8.4	Hf	043208			917	6.0	Bl	869	9.3	Ch
926	9.4	Ra	898	9.6	Fc	948	8.3	Hf	839	9.9	Ch	R Cae			882	9.5	Ch
927	9.9	Ry	901	9.6	Fc	956	8.0	Jo	882	10.2	Ch	*043738*			882	9.9	Fc
928	9.5	Hv	903	9.7	Fc	961	8.2	Jo	883	10.2	Fc	869	10.0	Bl	883	9.9	Fc
928	9.5	Bc	903	9.2	Jo	U Eri			884	10.4	Fc	883	10.4	Bl	884	9.7	Fc
931	9.6	Hm	904	9.7	Ah	*034625*			907	10.7	Fc	889	10.4	Bl	889	10.4	Fc
931	9.9	Ry	905	9.6	Fc	868	13.5	Ch	909	11.1	Fc	891	10.5	En	891	10.6	Fc
932	9.5	Hm	906	9.6	Fc	899[	12.6	En	R Ret			892	10.7	Ht	898	10.7	Fc
933	9.9	Ry	907	9.5	Fc	X Per			*043263*			895	10.6	En	906	10.6	Fc
934	9.4	Dl	909	9.6	Fc	034930			869	11.7	Bl	896	10.6	Bl	907	10.7	Fc
934	9.6	Hm	910	9.6	Fc	905	6.4	Lt	883	12.6	Bl	898	11.5	Ht	909	10.6	Fc
945	9.5	Hv	911	9.9	Hf	912	6.4	Lt	889	12.8	Bl	905	10.9	Ht	T Lep		
945	9.4	Bc	912	9.6	Mc	913	6.6	Mc	891	12.5	En	915	11.2	En	*050022*		
945	9.3	Jo	913	9.8	Hv	T Eri			895	12.5	En	916	11.0	Ht	869	8.2	Bl
947	9.5	Hv	913	9.4	Bc	*035124*			896	12.8	Bl	917	10.8	Bl	869	8.6	Ch
947	9.4	Bc	913	10.1	Pt	868	12.2	Ch	905[	12.3	Ht	922	11.?	En	882	8.8	Ch
951	9.6	Mc	915	9.7	Hv	899	10.7	En	917[	12.5	Bl	ST Cam			883	8.6	Bl
955	10.0	Hb	915	9.7	Bc	W Eri			X Cam			044067			889	8.6	Bl
956	9.2	Jo	R Per			*040725*			043274			884	6.9	Ks	891	8.9	En
R Hor			032335			868	8.0	Ch	868	10.8	Ch	RV Tau			895	8.7	En
025050			864	10.6	Ch	T Tau			882	11.9	Fc	044126			896	8.5	Bl
869	12.5	Bl	882	9.3	Ch	041619			884	11.7	Fc	897	10.0	Ks	915	9.1	En
883	12.6	Bl	883	9.2	Fc	883	9.9	Ks	884	11.6	Ks	R Pic			917	9.5	Bl
889	12.8	Bl	889	9.1	Fc	897	9.6	Ks	885	11.9	Fc	*044349*			S Pic		
892	13.0	Ht	891	9.3	Fc	R Tau			889	12.5	Fc	869	7.3	Bl	*050848*		
896	13.1	Bl	898	8.9	Fc	042209			891	12.3	Fc	883	6.7	Bl	889[	13.4	Bl
898	12.9	Ht	901	8.9	Fc	864	9.5	Ch	896	13.0	Fc	889	7.2	Bl	891[	12.9	En
905	12.9	Ht	903	8.5	Fc	973	10.0	Fc	898	13.2	Fc	891	7.0	En	898[	13.4	Ht
916	12.7	Ht	903	8.7	Jo	883	10.4	Fc	899	12.7	Ch	892	7.7	Ht	917[	13.4	Bl
917	13.3	Bl	905	8.8	Fc	884	10.4	Fc	901	13.0	Fc	895	7.2	En	922[	12.9	En
T Hor			907	8.8	Fc	883	10.1	Ks	913	13.0	Pt	896	7.3	Bl	R Aur		
025751			909	8.6	Fc	885	10.3	Fc	915	12.8	My	898	7.7	Ht	050953		
869	9.2	Bl	912	8.8	Hf	897	10.3	Ks	922	12.7	My	905	7.9	Ht	869	12.8	Ch
883	9.5	Bl	912	8.4	Rb	903	10.9	Fc	924	12.7	Jo	915	7.7	En	896	12.2	Fc
889	9.7	Bl	913	9.1	Pt	904	11.3	Fc	927	12.5	Jo	916	8.2	Ht	898	12.5	Ch
892	10.4	Ht	915	8.3	My	909	11.4	Fc	929	12.2	My	917	7.9	Bl	910	11.4	Ra

Variable Star Observations Received During May and June, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R Aur			**S Aur**			**T Ori**			**S Cam**			**RR Tau**			**SU Tau**		
050953			052034			*053005a*			053068			053326			054319		
913	11.8	Pt	910	11.1	Fc	725	10.1	Me	903	8.5	Jo	896	11.7	Ry	882	9.8	Ch
916	9.5	Md	910	10.7	Ra	753	9.9	Me	903	8.7	Fc	896	11.3	Fc	883	10.0	Fc
918	12.7	Jo	912	11.2	Rb	869	10.5	Ch	905	8.4	Fc	897	11.4	Ks	883	9.6	Ks
920	11.2	Cm	913	9.7	Mc	882	10.0	Ch	906	8.3	Fc	898	11.2	Fc	884	9.9	Fc
922	12.0	Ch	913	11.0	Pt	886	10.2	Ch	907	8.6	Fc	901	11.8	Br	885	9.9	Fc
923	11.8	Md	915	11.5	My	889	9.8	Me	909	8.6	Fc	903	12.0	Br	889	10.0	Fc
924	12.5	Jo	916	10.7	Md	891	10.0	Fc	910	8.7	Fc	903	11.6	Ry	889	10.1	Me
927	12.5	Jo	917	10.4	Dl	893	9.8	Me	912	8.6	Fc	903	11.4	Fc	891	10.0	Fc
929	11.7	Md	918	10.4	Dl	899	10.2	Pb	912	8.8	Hf	905	11.9	Fc	894	10.3	Br
T Pic			918	10.5	Jo	899	10.2	Dh	912	8.8	Sh	906	11.9	Br	894	10.4	Fc
051247			919	11.4	Rb	900	10.2	Ch	914	8.2	Kn	906	11.9	Fc	895	10.4	Br
870	9.9	Bl	919	11.8	Ba	901	9.6	Hu	915	8.4	Kg	907	11.9	Gy	895	10.4	Fc
883	11.0	Bl	920	10.9	Wd	903	10.0	Es	915	8.5	Pt	907	12.1	Wp	896	10.5	Br
889	11.1	Bl	920	11.2	Hf	903	10.6	Jo	918	8.4	Jo	907	12.2	Wa	896	10.5	Fc
891	11.0	En	921	10.6	Jo	905	9.9	Ar	922	8.3	Kg	907	12.0	Fc	897	10.0	Ks
892	11.5	Ht	921	12.0	Ch	906	10.0	Md	924	8.4	Jo	909	11.8	Fc	898	10.6	Fc
895	11.2	En	922	11.2	My	906	9.8	Es	924	7.8	Md	910	12.0	Fc	898	10.1	Ch
896	11.5	Bl	923	11.0	Md	906	9.9	Pb	926	8.3	Ra	911	12.3	Wp	901	10.7	Br
898	11.8	Ht	924	10.5	Jo	906	9.9	Ar	929	8.0	Md	912	12.1	Rb	903	10.7	Br
922	[12.5	En	927	10.7	Jo	910	9.9	Ra	929	8.5	Kg	913	11.4	Wp	903	9.7	Jo
T Col			929	11.7	Md	911	10.0	Wa	931	8.6	Jo	913	11.3	Wa	903	10.7	Fc
051533			929	11.0	My	912	9.3	Pb	933	8.2	Kn	915	11.4	Ry	905	10.7	Ar
870	10.7	Bl	934	10.4	Dl	912	9.7	Cm	934	8.7	Hf	916	11.5	Wp	905	10.8	Fc
883	10.0	Bl	**W Aur**			912	9.7	Pt	935	8.2	Jo	916	11.4	Wa	906	10.6	Br
889	10.0	Bl	052036			912	9.8	Ar	935	7.9	Md	918	11.6	Kn	906	10.7	Ar
891	10.0	En	869	12.1	Ch	912	9.8	Lf	942	8.7	Hf	918	11.0	Wp	906	10.7	Fc
892	10.1	Ht	884	12.3	Fc	913	9.6	Pt	943	8.0	Md	918	11.0	Wa	907	10.7	Fc
895	9.7	En	885	12.2	Fc	914	9.8	Dh	945	8.7	Hf	919	11.6	Rb	909	10.7	Fc
896	9.8	Bl	886	13.0	Ch	914	9.9	Kt	945	8.4	Jo	919	11.1	Ry	910	10.7	Fc
897	9.7	dK	889	12.6	Fc	915	10.3	My	947	8.7	Wp	920	10.9	Cm	911	10.7	Wp
898	9.8	Ht	891	12.6	Fc	**AN Ori**			947	8.5	Wa	923	11.4	Wp	911	10.7	Wd
904	9.4	dK	894	12.6	Fc	*053005t*			948	8.7	Hf	923	11.4	Wa	912	10.3	Hf
905	9.5	Ht	895	12.9	Fc	899	11.5	Pb	948	8.3	Jo	930	11.0	Wa	912	10.8	Rb
909	8.7	dK	896	13.1	Fc	899	11.5	Dh	953	8.8	Wp	930	11.1	Wp	912	10.2	Sh
915	8.3	dK	898	13.2	Fc	901	11.8	Hu	953	8.6	Hf	931	11.1	Wp	912	10.9	Ar
915	8.1	En	899	13.4	Ch	905	11.4	Ar	955	8.2	Kn	931	11.3	Wa	912	10.1	Pt
916	8.2	Ht	905	13.3	Fc	906	11.4	Pb	955	8.3	Fa	934	11.7	Wp	913	10.5	Ch
917	7.7	Bl	913	[12.3	Pt	906	11.4	Ar	956	8.4	Jo	**RU Aur**			913	10.6	Pt
924	8.1	En	**RR Cam**			910	11.3	Ra	**RR Tau**			053337			913	10.9	Ar
S Aur			052372			911	11.3	Wa	053326			869	[13.4	Ch	914	10.6	Pt
052034			943	9.6	Fa	912	11.3	Pb	723	10.9	Me	899	[13.4	Ch	914	11.0	Ar
869	11.2	Ch	947	9.7	Gy	912	11.5	Cm	724	10.6	Me	907	9.8	Gy	915	10.8	Pt
882	11.6	Ch	949	9.9	Wa	912	11.3	Ar	725	10.6	Me	915	[12.0	Pt	915	10.6	Ar
883	10.9	Fc	951	10.0	Wa	912	11.3	Lf	753	10.7	Me	**U Aur**			917	10.3	Sf
884	11.4	Fc	955	9.8	Wa	**S Cam**			882	11.3	Fc	053531			917	10.3	Hf
885	11.3	Fc	960	9.6	Wa	053068			883	11.9	Fc	869	[13.7	Ch	917	10.7	Pt
886	11.7	Ch	963	9.7	Gy	868	8.7	Ch	883	11.3	Ks	915	[12.5	Pt	918	10.8	Pt
889	11.3	Fc	**S Ori**			882	9.0	Fc	884	11.4	Fc	**Y Tau**			918	10.1	Ie
891	11.3	Fc	*052404*			883	8.5	Ks	885	11.9	Fc	053920			918	10.3	Hf
894	11.4	Fc	869	9.9	Ch	884	8.5	Ks	889	12.4	Fc	883	6.9	Ks	918	10.5	Wp
896	11.2	Fc	874	9.9	Ch	884	8.8	Fc	889	12.1	Me	897	7.0	Ks	918	9.7	Jo
898	11.5	Fc	882	10.0	Ch	885	8.6	Fc	891	12.8	Fc	**SU Tau**			918	10.7	Wa
899	11.8	Ch	891	10.3	Fc	889	8.6	Fc	891	12.7	Ks	054319			919	10.5	Rb
903	11.2	Fc	898	10.1	Ch	891	8.6	Fc	894	11.8	Br	724	10.2	Me	919	10.2	Ch
905	11.1	Fc	900	10.2	Ch	895	8.7	Fc	894	11.7	Fc	725	10.2	Me	920	10.5	Pt
906	11.1	Fc	913	11.4	Pt	896	8.7	Fc	895	11.6	Br	753	10.2	Me	921	10.1	Ch
907	11.1	Fc	918	10.6	Cm	898	8.7	Fc	895	11.4	Fc	868	9.7	Ch	921	9.6	Jo
909	11.1	Fc				899	8.4	Ch	896	11.4	Br	882	9.7	Fc	923	10.7	Wp

Variable Star Observations Received During May and June, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs
SU Tau			U Ori			Z Aur			X Aur			V Aur			Nov Pic		
054319			054920a			055353			060450			061647			*063462*		
923	10.6	Wa	882	8.7	Ch	895	10.6	Fc	883	8.4	Ks	911	8.8	Wp	891	9.0	En
930	10.5	Wp	883	8.5	Ks	896	10.0	Fc	884	8.4	Fc	912	9.0	Fc	892	9.1	Ht
930	10.5	Wa	884	8.9	Fc	898	10.1	Fc	885	8.5	Fc	916	9.0	Kn	895	9.0	En
S Col			885	8.9	Fc	901	10.1	Fc	887	8.4	Ks	916	9.3	Md	898	8.8	Ht
054331			889	9.0	Fc	903	10.4	Fc	889	8.7	Fc	918	9.4	Jo	905	9.1	Ht
870	9.2	Bl	891	9.0	Fc	903	10.2	Jo	891	8.6	Fc	923	9.2	Md	915	9.0	En
883	9.6	Bl	894	9.0	Fc	905	9.8	Fc	895	8.7	Fc	924	8.8	Jo	916	9.1	Ht
889	9.6	Bl	895	9.3	Fc	906	10.0	Fc	896	8.5	Fc	927	8.8	Jo	922	9.0	En
891	10.2	En	895	8.9	Kp	907	10.0	Fc	898	9.0	Fc	929	9.3	Md	S Lyn		
892	10.2	Ht	895	9.0	Ah	907	9.7	Gy	898	8.7	Ch	931	9.0	Jo	063558		
895	10.4	En	896	9.0	Fc	909	10.0	Fc	901	8.9	Ch	933	9.1	Cl	883	13.9	Ks
896	10.2	Bl	897	8.8	Ks	910	9.8	Fc	905	9.0	Fc	935	8.4	Jo	898	14.0	Ch
897	10.8	dK	898	9.3	Cl	912	10.3	Sh	906	9.1	Fc	937	8.5	Jo	919	13.8	Ry
898	10.5	Ht	903	9.0	Jo	912	10.1	Pt	907	9.3	Fc	940	8.8	Wp	923	13.8	Ry
904	10.8	dK	903	9.4	Fc	912	10.2	Rb	909	9.6	Fc	940	9.0	Wa	926	13.5	Ry
905	10.9	Ht	904	9.3	Ah	912	10.1	Hf	910	9.5	Fc	943	9.0	Jo	935	13.5	Ry
909	11.0	dK	905	9.6	Fc	913	10.5	Mc	911	9.5	Wp	943	9.4	Gy	X Gem		
915	10.8	En	906	9.4	Fc	918	10.4	Jo	912	9.8	Fc	944	9.0	Kn	064030		
915	11.2	dK	907	9.6	Fc	919	9.8	Hf	912	10.0	Sh	947	9.3	Gy	882	10.1	Fc
916	11.1	Ht	907	9.5	Gy	919	9.8	Rb	912	9.8	Hf	955	9.2	Gy	884	10.3	Fc
917	11.2	Bl	909	9.0	Fc	924	10.3	Jo	915	9.7	Pt	960	8.9	Es	885	9.6	Fc
922	11.3	En	910	9.8	Fc	927	10.4	Jo	915	10.0	Sf	V Mon			889	10.0	Fc
Z Tau			910	10.3	Ra	930	10.0	Pt	916	10.0	Kn	*061702*			891	9.8	Fc
054615a			911	9.9	Hf	931	10.0	Jo	916	10.2	Md	882	6.8	Fc	895	10.1	Fc
869	13.5	Ch	911	10.2	Wd	931	9.3	Gy	918	10.2	Jo	883	7.1	Ks	896	9.9	Fc
884	[11.7	Fc	913	10.0	Kp	934	9.6	Hf	919	10.1	Hf	884	6.6	Fc	898	9.3	Fc
896	[12.8	Fc	913	9.7	Ch	943	9.7	Gy	919	10.2	Ch	885	6.6	Fc	903	9.9	Fc
RU Tau			913	10.1	Cm	945	9.8	Hf	923	10.4	Ch	885	7.0	Ch	905	9.6	Fc
054615c			914	9.8	Lf	946	9.9	Mc	923	10.5	Sf	891	6.9	Fc	907	9.8	Gy
869	[13.5	Ch	914	9.3	Bu	947	9.7	Gy	923	10.4	Md	891	7.0	Ks	910	9.3	Ra
R Col			915	10.1	Pt	956	10.5	Jo	924	10.3	Jo	899	7.0	Ch	911	9.5	Wd
054629			915	9.3	Rc	961	10.6	Jo	926	10.6	Ra	912	7.6	Hf	911	9.7	Hf
870	11.8	Bl	916	9.9	Mc	RS Aur			927	10.6	Jo	UU Aur			911	9.0	Wp
883	10.1	Bl	918	10.4	Jo	055646a			929	11.3	Md	062938			912	9.4	Fc
886	9.4	Ch	918	9.8	Sh	923	9.4	Wd	931	11.0	Jo	906	5.9	Lt	912	9.8	Sh
889	9.3	Bl	918	10.4	Kp	946	11.5	Pf	934	11.4	Hf	912	5.9	Lt	914	9.0	Sx
891	8.5	En	921	10.0	Ch	954	10.6	Pf	940	11.9	Wa	U Lyn			917	8.6	Md
892	8.8	Ht	923	10.3	Md	R Oct			940	11.8	Wp	063159			917	8.4	Wd
895	8.1	En	UW Ori			*055686*			TV Gem			933	[12.4	Cl	920	8.6	Cm
896	7.9	Bl	054920b			060521			906	7.0	Lt	R Mon			924	8.3	Md
898	8.4	Ht	832	10.7	Ss	884	10.9	Bl	ξ Gem			063308			924	9.7	Jo
905	7.8	Ht	883	10.8	Ks	889	11.1	Bl	060822			883	12.2	Ks	925	8.4	B
915	8.0	En	897	10.5	Ks	892	10.8	En	851	3.4	Lt	885	13.2	Ch	927	9.5	Jo
916	8.0	Ht	911	10.5	Wd	892	11.0	Ht	V Aur			891	12.0	Ks	930	8.5	Md
917	7.8	Bl	V Cam			896	10.9	En	061647			895	12.8	Ks	931	8.6	Hf
922	7.8	En	054974			896	11.1	Bl	884	9.3	Fc	897	12.2	Ks	931	9.5	Jo
α Ori			899	13.8	Ch	898	11.2	Ht	885	9.4	Fc	898	13.2	Ch	933	8.5	Wd
054907			Z Aur			916	11.4	Ht	889	9.3	Fc	905	11.9	Ar	933	8.6	Hf
904	0.6	Mh	914	14.1	Ar	917	11.3	Bl	891	9.2	Fc	906	12.1	Ar	935	7.8	Md
912	0.6	Mh	055353			918	11.2	En	895	9.3	Fc	906	12.1	Pb	938	8.2	Wd
913	0.6	Mh	882	10.9	Fc	924	11.5	En	896	9.4	Fc	913	12.7	Pb	942	8.6	Hf
918	0.8	Dl	883	10.7	Fc	X Aur			898	9.2	Ch	914	11.8	Ar	943	8.3	Gy
U Ori			883	10.4	Ks	060450			906	9.3	Cl	915	12.6	Ar	Y Mon		
054920a			884	10.3	Fc	863	8.6	Ch	906	9.2	Fc	919	12.5	Es	065111		
774	7.0	Lu	885	10.6	Fc	869	8.5	Ch	907	9.1	Fc	920	12.2	B	886	12.8	Ch
831	6.7	Ss	889	10.4	Fc	873	8.6	Ch	907	9.3	Gy	921	13.2	Ch	900	12.6	Ch
832	6.9	Ss	891	10.8	Fc	877	8.2	Ch	908	9.1	B				911	11.9	Wp
868	7.6	Ch	894	10.6	Fc	882	8.7	Fc							823	10.9	Ch

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
Y MON			**RS GEM**			**R GEM**			**R GEM**			**R CMI**			**S CMI**		
065111			065530			070122a			070122a			070310			072708		
924	12.5	Jo	885	11.4	Fc	901	8.3	Fc	947	11.2	Jo	915	8.4	Sq	906	7.7	Fc
X MON			889	11.1	Fc	903	8.1	Fc	**Z GEM**			915	8.5	Pt	907	7.8	Wa
065208			891	11.2	Fc	903	8.5	Jo	070122b			916	8.5	Kn	907	7.7	Wp
867	7.5	Ks	895	11.6	Fc	904	8.2	Ah	910	12.2	Ra	918	8.6	Jo	909	7.6	Fc
883	7.7	Ks	896	11.2	Fc	904	8.0	Be	917	12.6	Wd	918	8.6	Md	910	7.9	Ra
884	7.3	Fc	898	10.8	Fc	905	8.5	Fc	923	12.7	Wa	920	8.9	Wd	911	7.6	Br
891	7.5	Fc	904	11.0	Be	906	8.4	Fc	923	12.5	Cm	920	8.4	Ks	911	8.0	Hf
891	7.8	Ks	905	10.6	Fc	906	8.4	Es	**TW GEM**			921	8.7	Jo	911	7.7	Hv
895	7.5	Fc	906	10.8	Fc	906	8.5	Md	070122c			923	8.8	Ch	911	8.0	Cm
895	7.7	Ks	907	10.6	Fc	907	8.8	Wa	830	8.6	Ss	923	8.6	Wa	912	7.6	Fc
897	7.9	Ks	907	10.5	Gy	907	9.0	Wp	831	8.7	Ss	923	8.9	Wp	912	8.2	Hm
911	8.1	Hf	909	10.8	Fc	907	8.3	Fc	832	8.2	Ss	924	8.6	Jo	913	7.5	Br
914	7.5	Bk	912	10.7	Sh	909	8.4	Fc	906	8.2	Lt	927	8.7	B	913	7.8	Br
914	7.2	Sx	912	10.6	Fc	910	8.6	Ra	910	8.2	Ra	931	9.1	Hf	913	7.5	Hv
917	8.1	Ha	912	9.8	Hf	911	9.0	Hf	911	8.4	Wd	937	8.8	B	913	7.8	Ha
917	7.7	Kn	912	10.8	Rb	911	9.0	Wd	911	8.4	Hf	**R VOL**			914	7.4	Hv
918	7.5	Md	917	11.1	Kn	911	8.8	Wa	914	8.4	Sx	*070772*			914	7.6	Sx
918	7.8	Ha	917	11.0	Md	912	8.6	Ah	918	8.5	Sh	891	13.4	En	915	8.0	Bk
920	7.5	Ks	919	10.3	Hf	912	8.6	Fc	919	8.3	Rb	895	13.4	En	915	7.7	Hv
922	7.6	Ha	919	10.4	Rb	913	9.0	Es	923	8.5	Sh	915	13.4	En	915	7.5	Pt
925	8.0	Md	923	11.1	Cm	913	8.3	Bu	923	8.4	Wd	**RR MON**			916	7.8	Ha
RV MON			924	10.7	Jo	913	8.4	Ch	933	8.3	Wd	071201			916	7.7	Kn
065306			927	11.0	Jo	914	8.8	Sx	933	8.2	Hf	898	[13.2	Ch	918	7.3	Ha
895	7.0	Ks	927	11.1	Md	914	8.6	Ah	934	8.4	Rb	921	[14.2	Be	918	7.9	Jo
897	7.6	Ks	934	10.8	Rb	914	8.3	Bu	938	8.3	Wd	**V GEM**			918	8.0	Dl
SW GEM			934	11.0	Hf	915	8.4	Pt	**R CMI**			071713			918	8.0	Sh
065326			935	11.0	Jo	916	9.3	Fs	070310			871	11.6	Ch	918	7.3	Md
931	9.2	Wd	943	11.2	Jo	917	9.5	Wd	832	8.4	Ss	898	12.9	Ch	920	8.0	Jo
938	9.1	Wd	944	11.6	Gy	917	9.0	Md	882	8.2	Fc	915	13.3	Pt	920	7.8	Wd
944	8.8	Rb	944	11.0	Rb	918	9.3	Hf	884	8.3	Fc	921	13.2	Be	920	7.7	Ks
946	8.9	Gy	947	10.9	Wp	918	9.4	Jo	885	8.3	Fc	926	13.8	L	921	7.7	Ha
947	9.3	Wp	947	11.1	Wa	918	9.2	Sh	886	8.2	Ch	**NOV MON**			921	7.2	Be
947	9.2	Wa	**V CMI**			919	9.4	Es	889	8.3	Fc	072106			921	7.5	Ch
949	8.8	Wa	070109			919	9.4	Rb	891	8.4	Fc	913	14.7	Pf	923	7.7	Wa
951	9.3	Wa	886	[13.5	Ch	920	9.3	Jo	891	8.4	Ks	**S CMI**			924	7.8	Jo
951	10.3	Mc	900	[13.5	Ch	923	9.0	Ch	895	8.1	Ks	072708			926	7.5	Hv
955	9.3	Wa	910	[12.5	Ra	923	9.5	Cm	895	8.6	Ah	832	8.7	Ss	926	7.0	Wh
960	8.9	Wa	923	[13.5	Ch	923	9.4	Sh	895	8.4	Fc	871	8.6	Ch	928	7.4	Hv
R LYN			**R GEM**			923	9.4	Wd	896	8.4	Fc	884	8.6	Fc	928	7.4	Bc
065355			070122a			923	9.7	Wa	898	8.8	Fc	885	8.6	Fc	930	7.9	Pg
882	11.6	Fc	774	8.7	Lu	924	9.4	Jo	901	8.4	Fc	889	8.0	Fc	931	7.7	Hf
883	11.3	Ks	783	8.7	Lu	924	9.6	Ah	903	8.4	Fc	891	7.8	Fc	931	8.0	Dl
884	11.8	Fc	830	8.5	Ss	925	9.4	Md	903	8.1	Jo	891	8.2	Ks	931	8.6	Hm
885	11.7	Fc	831	7.8	Ss	927	9.7	B	904	8.6	Ah	895	8.5	Ha	931	7.6	Md
889	12.2	Fc	832	7.7	Ss	927	9.8	Ah	904	8.2	Be	895	7.7	Fc	933	7.9	B
891	12.2	Fc	842	7.7	Ss	929	9.5	Bu	905	8.4	Fc	895	8.0	Ks	933	7.6	Wd
895	11.8	Fc	873	7.6	Ch	929	9.8	Ah	906	8.3	Fc	896	7.6	Fc	934	7.9	Dl
895	11.8	Ks	882	7.5	Ch	931	10.0	Jo	907	8.3	Fc	896	8.1	Hv	934	8.5	Hm
896	12.1	Fc	884	7.5	Fc	931	9.5	Fs	907	8.7	Wp	897	8.0	Ks	934	8.3	Rb
898	12.1	Fc	885	7.8	Fc	933	9.5	Wd	907	8.5	Gy	898	8.0	Ch	938	7.9	Dl
898	11.8	Ch	889	7.6	Fc	933	9.9	Ah	907	8.6	Wa	899	8.0	Hv	942	8.2	Rb
903	[11.9	Fc	891	7.7	Fc	933	9.5	Hf	909	8.3	Fc	901	7.7	Fc	942	7.9	Hf
907	[13.3	Fc	891	7.8	Ks	934	9.8	Rb	910	8.8	Ra	903	8.4	Fc	945	8.1	Hv
915	[13.5	Pt	895	8.1	Ah	935	10.2	Jo	911	8.7	Hf	903	8.6	Ha	945	8.1	Bc
RS GEM			895	7.9	Fc	937	9.1	B	912	8.2	Fc	903	8.1	Hv	947	8.1	Bc
065530			895	7.8	Ks	938	9.8	Wd	913	8.6	Ch	903	7.7	Jo	947	8.1	Hv
882	11.2	Fc	898	8.0	Fc	942	10.0	Hf	914	8.6	Sx	905	8.1	Hv	947	7.9	Bk
884	11.4	Fc	898	7.9	Ah	943	10.7	Jo	915	8.8	Sf	905	7.9	Fc			

Variable Star Observations Received During May and June, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
T CMi			**U CMi**			**RZ UMa**			**R CNC**			**V CNC**			**R CHA**		
072811			073508			080165			081112			081617			*082476*		
871	12.1	Ch	942	8.9	Hf	947	8.9	Hf	912	8.3	Fc	926	9.4	L	884	11.4	Bl
898	12.7	Ch	**Y GEM**			947	8.8	B	913	8.3	Ha	927	9.2	B	889	11.3	Bl
915	12.8	Pt	073520			949	9.0	Md	913	8.2	Kp	929	9.2	Md	891	11.5	En
921	13.3	Be	923	9.5	Wd	952	8.8	B	913	8.1	Bu	937	9.1	B	892	11.4	Ht
925	13.2	B	941	9.5	Wd	953	8.8	Hf	914	8.1	Bu	943	9.1	Gy	895	11.2	En
Z PUP			944	9.6	Rb	954	8.9	Hi	914	7.7	Sq	946	8.9	Sf	896	11.2	Bl
072820b			945	9.7	Hf	954	8.8	Wp	915	8.2	Sf	951	8.8	Sf	893	12.0	Ht
882	10.2	Fc	946	9.6	Gy	955	8.7	B	915	7.9	Pt	951	9.3	Mc	905	11.3	Ht
885	10.3	Fc	948	9.9	Wa	956	8.9	Hf	916	8.0	Ha	955	8.6	Gy	915	10.6	En
891	10.6	Fc	949	9.8	Wa	956	8.6	Jo	916	7.7	Md	**T LYN**			916	10.3	Ht
891	11.0	En	951	9.3	Wa	**RV CNC**			917	7.9	Ha	081633			917	10.5	Bl
894	11.0	Fc	955	9.2	Wa	080319			917	8.3	Hi	931	9.4	Wd	922	9.9	En
895	10.7	En	**S GEM**			894	11.8	Br	918	7.5	Hh	938	9.4	Wd	**U CNC**		
899	10.6	Ch	073723			895	11.8	Br	918	7.7	Jo	943	9.6	Fa	083019		
903	11.0	Fc	830	10.6	Ss	896	11.9	Br	918	7.5	Kp	945	9.4	Hf	885	12.2	Fc
906	11.2	Fc	831	11.6	Ss	901	11.7	Br	918	7.9	Sh	947	9.3	Gy	891	12.6	Fc
909	11.1	Fc	832	10.8	Ss	918	11.9	Br	920	7.9	Wd	948	9.5	Ar	895	13.5	Fc
915	11.4	En	842	11.6	Ss	919	11.9	Br	920	7.9	Hf	948	9.4	Hf	896	13.5	Fc
922	11.7	En	891	13.2	Ks	920	12.0	Br	921	7.4	Ha	949	9.2	Wa	899	13.3	Ch
S VOL			895	13.3	Ks	921	12.0	Br	921	7.3	Jo	950	9.3	Rb	926	14.6	L
073173			897	13.4	Ks	923	12.0	Br	921	7.1	Be	951	9.4	Wa	927	13.8	B
889	13.2	Bl	898	13.4	Ch	924	12.0	Br	923	7.3	Ch	955	9.3	Gy	932	11.9	Cl
895	13.2	En	919	14.1	Es	925	12.0	Br	923	7.4	Hi	955	9.4	Wa	**X UMA**		
917	13.5	Bl	921	14.0	Be	926	12.0	Br	923	7.6	Md	960	9.4	Wa	083350		
922	13.2	En	**W PUP**			929	12.1	Br	924	7.3	Jo	**RT HYA**			918	13.2	Cm
U CMi			*074241*			930	12.1	Br	925	7.3	Wh	*082405*			**S HYA**		
073508			870	9.0	Bl	935	12.0	Br	926	7.1	L	882	9.5	Fc	084803		
871	9.5	Ch	884	10.0	Bl	942	12.0	Br	927	7.1	Jo	885	9.1	Fc	863	8.0	Ch
885	9.1	Fc	890	11.1	Bl	950	12.0	Pg	927	7.1	Hi	891	8.7	Fc	884	8.7	Fc
889	9.0	Fc	891	11.2	En	**SU UMA**			929	7.6	Md	894	9.4	Fc	885	8.6	Fc
891	9.0	Fc	892	11.5	Ht	080362			929	7.3	Bu	895	9.3	Fc	888	9.2	Ch
894	9.0	Fc	895	11.9	En	894	11.3	Br	931	7.5	Hm	895	9.3	Hk	889	8.7	Fc
895	9.2	Fc	896	11.7	Bl	895	11.9	Br	932	7.6	Hm	896	8.9	Fc	891	8.8	Fc
896	9.2	Fc	898	12.5	Ht	918	14.0	Br	932	7.8	Hh	899	9.3	Hk	894	9.1	Fc
900	9.0	Ch	915	12.9	En	923	13.2	Br	933	7.0	B	903	8.8	Fc	895	8.7	Fc
901	8.9	Fc	917	12.8	Bl	**R CNC**			934	6.2	Hf	905	8.9	Fc	895	9.1	Hk
903	8.9	Fc	922	12.6	En	081112			934	7.6	Hm	906	9.1	Fc	895	9.2	Ah
903	8.7	Jo	**T GEM**			875	9.2	Ch	935	7.3	Md	906	8.9	Cl	896	9.1	Fc
905	8.9	Fc	074323			884	9.1	Fc	935	7.0	Jo	907	9.2	Wa	898	9.5	Ah
906	8.9	Fc	842	10.8	Ss	885	8.8	Fc	937	7.1	Yo	907	9.4	Wp	899	9.7	Hk
907	8.9	Wa	891	14.3	Ks	889	8.6	Fc	942	6.7	Sf	912	9.4	Fc	901	9.7	Fc
907	8.8	Wn	898	13.8	Ch	891	8.7	Fc	942	6.9	Hf	914	9.3	Hk	902	9.9	Fc
909	8.7	Fc	915	13.1	Pt	891	8.8	Ks	943	6.7	Hi	915	8.7	My	903	9.7	Fc
911	8.8	Hf	921	13.9	Be	894	9.0	Fc	943	7.1	Hb	916	8.5	Lt	905	10.3	Fc
912	8.7	Fc	923	12.9	Cm	895	8.7	Fc	945	7.2	Jo	918	9.0	Kn	906	10.1	Fc
915	8.5	Pt	943	13.1	Gy	895	9.1	Kp	947	6.8	Sf	918	8.6	Jo	911	10.3	Hf
916	8.6	Kn	**U PUP**			896	8.7	Ha	948	8.1	Hh	920	8.4	Jo	912	10.9	Ra
918	8.9	Hf	*075612*			896	8.7	Fc	948	6.5	Hi	922	8.6	Cl	912	10.7	Fc
918	8.8	Jo	899	13.4	Ch	899	8.5	Ch	953	6.8	Hf	922	8.8	My	914	10.6	Hk
918	8.6	Md	**RZ UMA**			901	8.6	Fc	954	6.5	Hi	925	8.4	Lt	915	10.7	Pt
918	8.9	Sh	080165			903	8.3	Jo	**V CNC**			929	8.6	My	916	9.4	Md
920	8.7	Wd	931	9.1	Wd	903	8.7	Fc	081617			932	8.6	Cl	918	10.5	Hf
921	8.3	Be	941	9.0	Wd	905	8.9	Fc	899	11.6	Ch	935	8.8	Jo	918	10.6	Jo
924	8.6	Jo	943	8.8	Fa	906	8.4	Fc	914	9.4	Sq	937	8.7	Jo	918	10.9	Sh
927	8.6	Jo	944	8.3	Wp	909	8.5	Fc	915	9.8	Pt	946	8.8	Kn	922	10.9	Ch
927	8.6	B	944	8.6	Wa	910	8.9	Ra	916	9.2	Md	**R CHA**			922	10.9	Cl
931	8.8	Hf	945	8.8	Hf	911	8.6	Hf	923	9.3	Md	*082476*			923	10.7	Md
931	8.6	Md				912	8.3	Hm	923	9.2	Ch	870	12.2	Bl	924	11.0	Ah

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S HYA			V UMA			R CAR			Y DRA			R LEO			R LEO		
084803			090151			*092962*			093178			094211			094211		
925	10.9	B	935	10.6	Jo	916	9.2	Ht	953	11.3	Wd	871	10.0	Ch	918	8.6	Ha
932	11.2	Cl	937	10.8	Jo	917	9.1	Bl	R LMI			882	9.3	Fc	918	8.4	Jo
T HYA			945	10.5	Hf	922	9.4	En	093934			884	9.8	Ch	918	8.6	Kp
085008			946	10.7	Mc	927	9.4	En	863	11.8	Ch	885	9.5	Fc	918	8.7	Dl
863	9.6	Ch	951	10.3	Mc	932	9.2	En	888	11.5	Ch	895	9.2	Kp	918	8.9	Sh
884	10.6	Fc	953	10.3	Wd	X HYA			895	10.2	Ks	895	8.8	Pb	919	8.6	Ba
885	10.7	Fc	954	10.2	Cl	*093014*			915	9.7	Sq	895	8.8	Ah	920	8.6	Bk
888	10.8	Ch	956	10.3	Hf	863	9.0	Ch	915	10.0	Pt	895	9.0	Fc	920	8.6	Kd
889	10.9	Fc	956	10.7	Jo	875	8.7	Ch	917	10.0	Hf	895	8.9	Ks	921	8.5	Ha
891	11.0	Fc	961	10.7	Jo	885	8.7	Fc	917	9.6	Md	896	8.6	Fc	922	8.2	Mc
894	11.2	Fc	W CNC			888	8.4	Ch	917	9.8	Hi	897	9.2	Ha	923	8.8	Sf
895	11.2	Fc	090425			895	8.8	Fc	918	9.8	Hf	898	8.8	Pb	923	8.4	Wa
896	11.0	Fc	915	12.8	Pt	896	8.7	Fc	918	9.5	Cm	898	8.8	Ah	924	8.6	Hf
899	11.7	Hk	919	13.6	Ch	899	8.6	Hk	918	9.8	Sh	899	9.1	Dh	924	8.3	Jo
903	11.6	Fc	926	14.3	L	902	8.9	Fc	920	9.9	Jo	899	8.8	Pb	924	8.4	Ah
918	11.8	Jo	942	12.8	Rb	905	8.8	Fc	923	9.7	Hi	902	8.7	Fc	925	8.3	Md
918	12.3	Md	RW CAR			911	8.9	Hf	924	9.7	Jo	904	9.4	Kd	926	8.1	Hv
922	12.2	Ch	*091868*			912	8.5	Hm	924	9.4	Md	904	8.7	Ah	927	7.9	Jo
925	12.3	B	890	12.8	Bl	912	8.8	Ra	926	9.3	Ra	907	8.5	Wa	927	8.4	Ah
T CNC			895	12.8	En	913	8.7	Hm	927	9.4	Jo	907	8.4	Wp	928	8.7	Kd
085120			916	12.8	Ht	914	9.2	Hk	931	9.4	Wd	911	8.8	Ac	928	8.0	Hv
875	10.0	Ch	922	12.8	En	915	9.0	Pt	932	9.2	Wp	911	8.7	Hf	928	7.9	Bc
901	9.9	Ch	TU LEO			918	9.1	Sh	934	9.5	Hf	911	8.6	Ba	929	8.4	Ah
902	10.0	Fc	082421			918	9.5	Kn	935	9.0	Jo	911	8.8	Wd	930	7.5	Pg
908	9.0	Be	920	13.8	Br	918	9.0	Dl	937	8.8	B	911	8.7	Wa	930	8.0	Wa
911	10.2	Hf	923	13.9	Br	920	9.5	Jo	937	9.1	Jo	912	8.8	Sz	930	7.8	Wp
915	9.0	Pt	925	12.9	Br	922	9.4	Ch	938	9.2	Gy	912	8.6	Ah	930	8.4	Ac
916	9.6	Md	929	13.7	Br	923	9.2	Cm	941	9.0	Wd	912	8.8	Ra	931	8.3	Dl
918	9.2	Jo	931	12.9	Br	924	9.7	Jo	942	8.9	Rb	912	8.9	Wa	931	8.6	Hm
919	10.1	Hf	935	12.9	Br	927	9.7	Jo	942	8.9	Hf	912	7.6	Fc	931	8.4	Md
927	8.7	Jo	950	13.0	Pg	930	9.6	Pg	943	9.0	Hi	913	8.4	Bc	931	8.2	Fs
929	9.7	Md	Y VEL			931	9.5	Hf	943	8.9	Gy	913	8.7	Ha	932	8.7	Hm
934	9.9	Hf	*092551*			931	9.4	Hm	945	8.0	Jo	913	8.5	Hv	932	8.3	Ah
935	8.7	Jo	870	13.4	Bl	934	9.2	Hm	948	8.8	Hi	913	8.4	Kp	934	8.7	Hm
937	8.7	Jo	890	13.4	Bl	937	10.1	B	949	8.0	Sq	913	8.5	Mc	934	8.4	Hf
942	9.9	Hf	896	13.5	Bl	942	9.9	Hf	950	8.8	Sh	913	8.5	Ch	935	7.7	Jo
S PYX			917	13.5	Bl	943	10.3	Gy	950	8.6	Md	913	8.4	Cm	935	8.0	Md
090024			R CAR			943	10.0	Ht	954	7.9	Gy	914	8.9	Dh	937	7.5	Pb
871	11.2	Ch	*092962*			946	10.3	Kn	953	8.6	Hf	914	8.5	Hv	937	7.5	Jo
899	9.4	Hk	816	4.7	Ss	Y DRA			954	7.9	Hi	914	8.7	Kd	938	8.3	Dl
T PYX			830	5.1	Ss	093178			955	7.8	Jo	914	8.7	Ah	938	7.6	Pb
090031			852	6.0	Ss	884	9.6	Fc	960	7.5	Es	914	8.7	Sq	938	8.2	Wd
890	13.0	Bl	855	7.0	Ss	885	9.6	Fc	RR HYA			915	8.4	Bk	938	7.9	Wp
917	13.0	Bl	861	6.9	Ss	888	9.2	Ch	*094023*			915	8.8	Dh	938	7.8	Wa
V UMA			867	7.7	Ss	895	9.7	Br	863	9.2	Ch	915	8.4	Hv	940	8.7	Sz
090151			870	7.0	Bl	895	9.5	Fc	885	9.9	Fc	915	8.8	Sf	940	7.5	Dh
911	10.5	Hf	886	8.0	Bl	898	9.9	Fc	891	9.7	En	915	7.7	Pt	940	7.2	Pb
915	10.1	Cl	891	8.4	En	902	9.9	Fc	895	9.1	Hk	915	8.3	Wa	940	7.9	Wp
918	10.6	Jo	892	8.6	Ht	905	9.6	Fc	895	9.9	Fc	915	8.4	Bc	940	7.8	Ac
918	10.6	Cm	895	8.5	En	906	9.9	Fc	896	9.9	En	915	8.3	Wp	940	7.9	Wa
919	10.5	Hf	896	8.9	Bl	912	9.8	Fc	905	10.1	Fc	916	8.9	Ac	940	8.0	Fs
922	10.5	Mc	897	8.4	dK	917	10.1	Hf	906	10.6	Fc	916	8.5	Fs	941	8.0	Td
924	10.5	Jo	898	8.5	Ht	928	10.6	Ch	915	10.4	En	916	8.7	Ha	941	7.5	Dh
927	10.6	Jo	904	8.7	dK	934	10.8	Hf	915	10.8	My	916	8.8	Kd	941	8.4	Dl
928	10.3	B	905	8.7	Ht	944	11.5	Gy	922	10.9	My	917	8.9	Ac	941	7.0	Pb
931	10.4	Cm	909	8.7	dK	946	11.5	Cl	922	11.0	En	917	8.6	Kp	941	8.1	Wd
933	10.3	Cl	915	8.7	dK	947	11.8	Hf	929	11.4	My	917	8.8	Md	941	7.8	Wp
934	10.8	Hf	915	8.9	En	948	11.5	Ie				917	8.9	Wd	941	8.0	Md

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
	R Leo			R Leo			V Leo			RY Leo			S Sex			V Hya	
	094211			094211			095421			095814			102900			*104620*	
941	7.8	Wa	956	8.4	Dl	863	13.6	Ch	953	10.8	Hf	951	10.9	Wa	896	8.0	Bl
942	8.4	Kp	965	7.3	Wd	885	13.0	Ch	954	10.8	Wa	953	10.8	Hf	899	8.0	En
942	8.4	Hf	965	7.3	Kg	894	12.3	Br	954	10.8	Hi	955	11.4	Gy	899	9.1	Hk
942	8.1	Sf	965	7.3	Lr	909	10.1	Es	954	10.6	Wp	960	11.4	Wp	900	8.7	Hf
943	8.0	Hb		Y Hya		913	10.7	Cm	955	10.7	B	960	11.3	Wa	903	7.7	Jo
943	8.2	Hv		*094622*		915	10.0	Pt		S Car			U Hya		913	7.9	Be
943	7.7	Ah	885	7.9	Ks	915	10.3	Sf		*100661*			*103212*		914	8.5	Hk
943	8.1	Bu	891	7.5	En	918	10.2	Cl	870	6.9	Bl	875	5.3	Ch	917	8.6	Hf
944	7.8	Wp	915	6.6	Pt	923	10.3	Sf	886	6.2	Bl	891	5.4	Ka	917	8.4	Bl
944	7.8	Wa	915	8.0	En	932	10.1	Wp	891	6.0	En	893	5.5	Ka	917	7.8	Pt
944	8.0	Bk	922	7.2	En	933	9.6	Cl	892	5.8	Ht	902	5.5	Ka	918	8.8	Sh
945	7.6	Jo		S LMi		935	9.6	Jo	896	5.8	En	927	5.5	Ka	918	7.9	Jo
945	8.0	Hv		094735		937	9.6	Jo	896	6.2	Bl	926	5.7	Ka	918	8.8	Kn
945	7.1	Pb	894	13.5	Br	937	9.8	B	897	6.0	dK	928	5.9	Kd	918	9.1	Md
945	8.0	Bc	943	12.7	Fa	938	10.0	Wa	898	5.5	Ht	928	5.7	Ka	922	8.3	Ch
946	8.2	Td	944	13.0	Wa	938	9.9	Wp	904	6.3	dK	931	5.3	Hm	924	7.9	Jo
946	8.0	Hv	944	13.0	Wp	942	9.8	Sf	905	5.8	Ht	934	5.5	Hm	925	8.9	Md
946	7.4	Dh	946	12.5	Pf	947	10.3	Es	909	6.3	dK		RZ Car		927	7.7	Jo
946	7.8	Mc	947	12.9	B	948	9.6	Cl	915	6.4	dK		*103270*		927	8.2	En
946	7.8	Wa	948	12.5	Hi	949	9.8	Sf	915	6.2	En	891	10.8	En	930	8.8	Md
946	8.4	Kp	949	12.5	Md	955	10.4	Jo	916	5.8	Ht	892	11.1	Ht	934	8.7	Hf
947	7.8	Hv	949	12.5	Hf	958	9.8	Es	917	6.4	Bl	895	11.3	En	935	8.6	Md
947	8.0	Bu	953	12.7	B		RR Car		922	6.3	En	898	10.8	Ht	935	7.4	Jo
947	8.0	Dl	954	12.8	Hi		*095458*		932	6.5	En	905	11.3	Ht	942	8.7	Hf
947	7.8	Bc	954	12.4	Pf	891	7.7	En		U UMa		916	12.3	Ht	945	7.5	Jo
947	8.1	Sf	954	13.0	Wp	892	8.2	Ht		100860		922	12.7	En	946	8.6	Kn
948	7.8	Dh	955	12.4	B	896	7.9	En	888	6.4	Ch		R UMa		950	8.5	Md
948	8.5	Dl	960	12.0	Es	898	8.3	Ht	912	6.5	Lt		103769			RS Hya	
948	8.1	Wd		U LMi		905	8.4	Ht	925	6.5	Lt	863	11.2	Ch		*104628*	
948	8.5	Kp		094836		916	8.4	Ht		Z Car		885	12.3	Ch	871	13.3	Ch
949	7.9	Sq	894	12.0	Br	922	7.7	En		*101058a*		894	12.2	Br	890	[13.6	Bl
949	7.7	Wa	946	12.7	Pf		RV Car		870	10.6	Bl	895	12.3	Pb	917	[13.6	Bl
950	7.9	Hv	946	12.8	Gy		*095563*		886	10.6	Bl	911	12.7	Wd	932	[12.5	Hk
950	7.7	Ah	947	13.1	Wp	870	[13.1	Bl	891	10.7	En	913	12.6	Ch		W Leo	
950	8.4	Dl	947	13.0	Wa	891	[13.1	En	892	11.2	Ht	915	12.7	Pt		104814	
950	8.3	Sh	954	12.8	Pf	896	13.4	Bl	896	10.8	En	918	11.9	Cm	863	12.4	Ch
951	7.8	Hv	955	12.5	Rb	898	13.1	Ht	896	11.2	Bl	919	11.4	Ba	885	12.6	Ch
951	7.9	Bu	955	12.5	Wa	905	12.6	Ht	898	10.9	Ht	925	12.5	Dt	894	12.8	Br
951	7.9	Kg	960	12.9	Wa	916	11.4	Ht	905	11.1	Ht	948	13.0	Hi	913	13.0	Cm
951	7.8	Bc	960	12.8	Wp	917	11.2	Bl	915	11.4	En	950	11.5	Wp	919	13.3	Es
951	7.7	Mc		SY UMa		922	11.3	En	916	12.0	Ht	953	12.7	Wd	959	[12.7	Es
951	8.2	Kp		094950		932	10.7	En	917	11.6	Bl	953	12.2	Cl		RS Car	
952	7.8	Hv	925	5.0	Lt		RY Leo		922	11.8	En	953	13.5	Td		*110361*	
952	7.9	Bc	933	5.0	Lt		095814			W Vel		954	13.5	Td	891	[12.3	En
953	7.8	Hv		Z Vel		921	9.2	Wd		*101153*		954	13.0	Hi		S Leo	
953	8.1	Dl		*094953*		941	10.2	Wd	890	[13.0	Bl	955	13.5	Td		110506	
953	8.4	Hf	890	12.2	Bl	944	10.3	Wd	896	[13.0	En	963	12.4	Gy	863	12.0	Ch
953	8.0	Bk	891	12.1	En	944	10.3	Hf	917	12.8	Bl		V Hya		885	13.0	Ch
953	7.9	Bu	892	12.3	Ht	945	10.4	Hf	922	[13.0	En		*104620*		894	13.8	Br
954	8.0	Td	896	11.7	Bl	945	10.7	Fa		S Sex		963	7.4	Ch	917	[13.1	Pt
954	8.0	Hv	896	11.9	Fn	946	10.1	Hu		102900		870	7.8	Bl	947	12.2	Es
954	7.5	Pg	898	12.3	Ht	947	10.4	B	931	9.7	Wd	875	8.0	Ch	948	12.4	Cl
954	8.1	Bc	915	11.6	En	947	10.8	Wa	943	10.3	Fa	885	8.1	Ch	958	12.4	Es
955	7.9	Td	916	12.1	Ht	947	10.9	Wp	945	10.5	Hf	885	8.1	Ks		RY Car	
955	7.7	Wa	917	11.6	Bl	948	10.5	Hk	946	10.6	Wa	886	7.9	Bl		*111561*	
955	7.2	Jo	922	12.3	En	948	10.5	Hi	947	10.5	Gy	888	8.4	Ch	870	12.3	Bl
956	7.7	Cx				948	10.6	Hf	948	11.2	Hk	892	8.2	En	886	12.6	Bl
956	8.1	Wd				952	10.6	B	948	10.7	Hf	896	8.0	En	892	13.1	Ht

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
RY CAR			Z UMA			SU VIR			R CRV			R CRV			T CVN		
111561			115158			120012			*121418*			*121418*			122532		
896	13.0	Bl	942	8.6	Kp	918	11.9	Br	917	9.1	Pt	953	10.0	Hf	870	11.0	Ch
917	13.5	Bl	942	8.5	Hf	920	11.8	Hf	917	8.8	Wd	955	10.8	Jo	885	10.2	Ks
RS CEN			943	8.0	Hb	920	11.7	Wd	918	8.3	Jo	957	10.1	B	900	10.6	Ch
111661			945	8.2	Hf	922	11.4	My	918	8.9	Dl	958	10.4	Wd	900	10.9	Hf
870	10.3	Bl	946	8.0	Kp	923	11.0	Wp	918	8.8	Sh	960	10.7	Wa	902	10.8	Fc
886	11.8	Bl	948	7.8	Kp	923	11.0	Wa	919	8.8	Ba	961	11.3	Jo	903	10.4	Jo
891	12.1	En	948	8.2	Wp	924	11.2	Jo	920	8.4	Bk	RY UMA			907	10.8	Wp
892	12.8	Ht	948	7.9	Hf	927	11.4	Jo	920	8.7	Kd	121561			907	10.8	Wa
895	12.1	En	950	7.8	Hf	929	10.9	My	921	8.7	Jo	906	7.6	Lt	913	10.1	Rc
896	12.7	Bl	950	7.8	Sh	929	10.9	L	922	9.0	Mc	913	7.6	Lt	915	10.4	B
898	13.1	Ht	950	7.7	Rb	930	10.4	Wp	923	9.3	Wd	923	7.3	Lt	917	10.1	Hi
917	13.1	Bl	950	7.8	Kp	930	10.6	Wa	923	9.0	Wa	933	7.5	Lt	917	10.0	Pt
922	13.1	En	951	7.7	Kp	932	10.3	Cl	923	9.3	Sh	SS VIR			917	10.5	Hf
X CEN			953	7.8	Wp	933	10.1	Hk	924	9.0	Jo	122001			918	10.7	Md
114441			953	7.8	Hf	934	10.2	Wp	924	8.7	Kd	885	7.6	Fc	923	10.2	Hi
870	10.0	Bl	956	7.8	Hf	934	10.4	Wa	925	8.8	Dt	895	8.0	Hk	924	10.2	Jo
886	10.8	Bl	956	7.9	Hb	934	9.9	Hf	926	9.0	Bu	895	8.1	Pb	925	10.5	Md
892	11.1	En	R COM			938	9.6	Wp	926	8.7	Wh	898	8.0	Fc	927	10.1	Jo
892	11.3	Ht	115919			938	9.8	Wa	927	9.3	Jo	899	8.0	Hk	931	9.9	Gy
896	11.1	En	885	8.9	Fc	940	9.5	Sz	927	9.0	Kd	900	7.9	Hf	931	9.9	Hf
896	11.0	Bl	885	8.6	Ks	942	9.7	Hf	928	8.9	Kd	903	7.5	Jo	932	10.2	Wp
898	11.7	Ht	888	8.5	Ch	943	9.4	Hk	929	9.0	Bu	906	8.2	Cl	935	10.2	Br
905	11.7	Ht	894	8.5	Br	948	9.6	Ie	930	9.4	Pg	907	7.6	Wp	940	9.9	Hf
917	11.8	Bl	898	8.6	Pb	953	9.2	Cl	931	9.1	Hf	907	7.6	Wa	947	10.1	Gy
922	12.2	En	902	8.7	Fc	953	9.7	Hf	931	9.5	Jo	912	8.1	Hf	948	10.1	Hi
AD CEN			903	8.6	Jo	956	9.7	Jo	931	9.0	Ie	912	7.8	Sz	949	10.5	Md
114858			907	9.1	Wp	961	10.1	Jo	931	9.4	Dl	912	8.2	Sh	953	10.2	Hf
892	9.4	Ht	907	8.9	Wa	T VIR			931	9.5	Fs	913	7.3	Be	954	10.3	Hi
898	9.5	Ht	912	9.2	Sh	*120905*			933	9.4	B	914	7.9	Hk	955	10.4	Jo
905	9.5	Ht	912	9.2	Hf	917	12.5	Pt	934	9.5	Dl	917	7.8	Kn	956	10.4	Wd
916	9.5	Ht	918	9.4	Jo	943	12.5	Hk	934	9.1	Wp	917	8.0	Md	961	9.8	Jo
W CEN			919	9.3	Ie	R CRV			934	9.3	Wa	918	7.6	Jo	963	10.1	Gy
115058			920	9.2	Hf	*121418*			935	9.6	Jo	920	8.0	Cl	Y VIR		
870	8.4	Bl	920	9.3	Wd	885	7.6	Fc	937	9.8	Jo	921	7.6	Jo	*122803*		
886	9.5	Bl	923	9.7	Hi	885	7.9	Ks	940	9.6	Wp	924	7.5	Jo	888	9.0	Ch
892	10.3	En	924	9.9	Io	895	8.0	Hk	940	9.8	Wa	924	8.0	Hf	898	9.5	Fc
892	10.0	Ht	927	10.3	Jo	895	8.0	Pb	940	9.6	Sz	925	8.2	Md	899	9.4	Hk
896	10.7	En	931	9.9	Gy	899	8.0	Hk	941	10.0	Wa	927	7.4	Jo	900	9.2	Hf
897	9.9	Bl	932	9.6	Wp	900	8.2	Hf	942	9.8	Hf	930	8.0	Md	900	9.6	Ch
898	10.7	Ht	934	9.8	Hf	903	8.2	Jo	943	10.5	Jo	932	7.3	Wp	903	9.7	Jo
905	10.9	Ht	938	10.0	Wp	904	7.9	Kd	943	9.7	Hk	932	8.1	Cl	907	9.8	Wp
916	11.3	Ht	942	9.9	Hf	907	8.1	Wa	943	9.3	Bu	933	7.8	Hk	907	9.8	Wa
917	11.4	Bl	938	10.2	Wa	907	7.9	Wp	944	10.1	Kn	935	7.6	Md	913	10.0	Be
922	11.7	En	943	10.6	Hi	911	8.3	Ba	944	9.8	Pg	935	7.0	Jo	915	10.3	My
Z UMA			947	10.7	Gy	911	8.4	Wd	944	9.8	Wp	937	7.2	Jo	917	10.2	Hf
115158			953	10.8	Hf	912	8.7	Sz	944	9.9	Wa	940	7.6	Sz	917	10.3	Dl
895	8.6	Kp	954	10.8	Hi	913	8.4	Mc	946	10.2	Hb	940	7.5	Hf	918	10.4	Dl
911	9.1	Hf	956	10.8	Wd	913	8.3	Kd	946	10.2	Dh	941	7.7	Md	918	10.6	Cm
911	9.0	Kp	963	10.9	Gy	913	8.3	Bu	946	10.3	Mc	944	7.8	Kn	918	10.2	Jo
913	8.9	Kp	SU VIR			914	8.7	Hk	946	9.8	Wa	946	7.6	Cl	921	10.5	Jo
917	9.5	Kp	120012			914	8.6	Kd	947	10.5	Hk	950	7.3	Md	922	10.3	My
918	9.1	Hf	901	12.9	Br	914	8.3	Bu	947	9.4	Bu	953	7.5	Hf	924	10.8	Jo
918	8.9	Kp	912	11.9	Sz	915	8.6	Sq	947	10.0	Bk	955	7.0	Jo	927	11.5	Jo
918	9.0	Sh	913	12.3	Be	916	8.6	Fs	948	10.2	Wd	956	7.2	Es	929	10.7	My
924	9.0	Hf	915	11.9	My	916	8.6	Kd	949	10.1	Wa	961	7.8	B	931	10.9	Hf
934	8.9	Hf	917	12.3	Hf	917	8.8	Hf	950	10.1	B	961	7.2	Jo	932	11.0	Wp
935	8.8	Kp	917	12.4	Pt	917	8.5	Kn	951	10.4	Mc				932	11.1	B
938	8.4	Rb	918	11.2	Cm	917	8.9	Dl	953	10.2	Bk				933	11.1	Hk

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
Y VIR			T UMA			T UMA			R VIR			RS UMA			S UMA		
122803			123160			123160			123307			123459			123961		
948	12.0	Ie	920	8.0	Rc	949	8.3	Sa	917	9.2	Pt	920	12.0	Es	924	7.2	Jo
U CEN			922	8.1	Mc	950	8.1	Sh	918	9.0	Jo	923	12.5	Ry	925	7.3	Ah
122854			923	7.5	Bc	950	8.3	Ah	918	9.7	Md	924	12.5	Jo	925	8.0	Wh
870	9.3	Bl	923	7.5	Hv	950	8.0	Dl	919	9.4	Ba	925	12.3	Md	926	7.9	Hv
886	10.2	Bl	924	7.3	Jo	950	7.9	Bc	919	9.6	Ss	926	13.0	Ry	927	7.4	Jo
892	10.6	En	925	7.9	Ah	951	8.3	Mc	920	9.6	Ss	929	13.1	Ry	928	7.8	Hv
892	10.8	Ht	925	7.9	Md	951	8.0	Hv	920	9.7	Bk	930	13.0	Pg	928	8.0	Bc
896	10.9	En	926	7.8	Hv	951	8.2	Sa	920	9.4	Rc	931	13.1	Gy	929	7.7	Ah
897	10.9	Bl	927	7.4	Jo	951	8.4	Ah	921	9.8	Md	932	13.1	Ry	930	7.6	Rc
898	11.0	Ht	928	7.6	Hv	951	8.0	Bc	924	9.8	Hf	932	12.7	Cl	931	8.1	Dl
917	12.2	Bl	928	8.1	Cl	952	7.9	Bc	924	9.7	Jo	935	13.1	Ry	931	8.2	Hm
922	12.3	En	928	7.5	Bc	952	8.0	Hv	925	10.0	Md	944	13.4	Pg	931	8.4	Gy
T UMA			929	8.0	Ah	952	8.4	Gy	925	9.5	Dt	949	13.5	Ie	931	7.6	Ah
123160			930	8.0	Rc	953	8.1	Hv	925	10.0	Ah	958	13.6	Es	932	8.3	Hm
870	11.7	Ch	931	8.0	Dl	953	8.1	Dl	926	9.4	Ra	965	13.5	Kg	932	7.5	Ah
885	10.4	Ks	931	8.2	Hm	953	8.6	Wp	927	9.6	Jo	S UMA			932	7.4	Cl
888	10.4	Ch	931	7.9	Gy	953	8.3	Hf	927	10.0	Ah	123961			932	8.0	Lu
895	9.5	Pb	931	8.0	Ah	954	8.1	Hv	929	9.8	Ah	870	8.3	Ch	933	7.6	Ah
895	9.2	Ah	931	7.8	Md	954	8.4	Gy	930	10.1	Pg	885	8.1	Ks	934	8.4	Dl
896	9.0	Br	932	8.3	Hm	954	8.5	Kg	931	10.2	Fs	888	8.3	Ch	934	8.1	Hf
898	9.0	Fc	932	8.1	Ah	954	8.1	Bc	932	9.9	Ah	895	8.2	Ah	934	8.1	Hm
898	9.6	Pb	932	8.1	Lu	955	8.2	Gy	933	9.8	Hk	895	8.3	Pb	934	7.4	Sa
899	8.6	Hv	933	8.1	Ah	955	8.4	Fa	933	10.0	Ah	898	8.2	Pb	935	7.8	Ah
903	8.5	Hv	934	8.4	Hm	955	8.2	Jo	934	9.8	Hf	899	8.0	Hv	936	7.7	Ah
903	7.8	Jo	934	7.8	Sa	956	8.3	Hf	940	9.5	Sz	903	7.9	Hv	938	8.4	Dl
904	8.3	Ah	934	7.7	Hf	956	8.0	Dl	942	9.9	Hf	903	7.5	Jo	940	7.9	Sz
905	8.5	Hv	934	7.8	Dl	958	8.5	Es	943	10.0	Hk	904	7.9	Ah	940	7.6	Sa
906	8.2	Es	935	8.1	Bs	960	8.3	Es	944	10.2	Pg	905	7.9	Hv	941	8.4	Dl
909	8.1	Es	935	8.0	Ah	960	8.8	Dl	946	10.2	Mc	909	7.9	Hv	941	8.4	Wd
909	8.3	Hv	935	7.7	Md	960	8.2	Fa	950	9.9	Bu	911	7.7	Bc	941	7.7	Kg
911	8.0	Bc	936	8.0	Ah	961	8.5	Jo	950	10.0	Md	911	8.2	Hf	942	7.9	Sa
911	8.0	Hf	938	7.7	Dl	963	8.5	Gy	950	9.7	Kp	911	7.7	Hv	942	8.2	Hf
911	7.9	Hv	940	7.7	Sz	964	8.6	Bu	951	9.9	Mc	911	8.3	Wd	943	8.1	Hv
911	7.9	Wd	940	7.9	Sa	965	8.8	Kg	953	9.6	Bu	912	7.9	Sa	943	7.9	Ah
912	8.0	Sz	941	7.8	Es	965	8.8	Lr	953	9.7	Hf	912	7.5	Sz	944	8.0	Ah
912	8.1	Sa	941	7.7	Dl	R VIR			955	9.6	Io	912	8.5	Sh	945	8.2	Hv
912	7.9	Sh	941	7.8	Wd	123307			961	9.6	Jo	913	8.1	Bc	945	8.3	Bc
913	7.8	Bc	941	8.5	Kg	870	6.8	Ch	RS UMA			913	8.0	Hv	945	8.5	Hf
913	7.9	Hv	942	7.7	Hf	895	7.4	Hk	123459			913	7.5	Mc	946	8.5	Hv
913	8.5	Mc	942	8.0	Sa	895	7.5	Pb	870	10.0	Ch	913	7.7	Ah	946	8.6	Gy
913	8.1	Ah	943	7.9	Hv	895	7.8	Ah	885	10.4	Ks	913	7.7	Ch	946	8.2	Mc
913	7.9	Ch	943	8.1	Ah	897	8.0	Ah	888	10.4	Ch	913	8.0	Rc	947	8.5	Hv
913	8.2	Rc	943	8.0	Md	898	8.1	Ah	895	9.8	Pb	914	7.8	Hv	947	8.5	Bc
914	7.8	Hv	944	8.2	Ah	899	7.8	Hk	895	10.4	Ry	914	7.8	Sq	948	7.6	Cl
914	7.6	Sq	945	7.9	Hf	900	7.3	Ch	896	10.4	Br	915	7.7	B	948	8.4	Dl
915	8.0	B	945	7.9	Bc	903	7.6	Jo	902	10.2	Fc	915	7.7	Bc	948	8.0	Gy
915	7.6	Bc	946	7.9	Hv	904	8.4	Ah	903	10.4	Jo	915	7.8	Hv	948	8.2	Wp
915	7.7	Hv	946	8.4	Gy	911	8.5	Ba	903	10.6	Ry	917	7.5	Pt	948	8.5	Hf
916	8.0	Md	946	8.0	Mc	912	8.5	Hf	909	11.2	Ry	917	7.6	Sa	949	8.2	Sq
917	8.1	Sa	947	8.0	Hv	912	8.8	Sz	911	11.1	Wd	918	7.3	Jo	949	8.2	Sa
917	8.1	Pt	947	8.0	Bc	912	8.9	Ah	912	11.5	Hf	918	7.8	Cm	950	8.4	Ah
918	7.2	Jo	948	8.1	Wp	912	8.5	Sh	913	11.6	Ch	918	8.1	Dl	950	8.6	Dl
918	8.0	Md	948	7.8	Cl	913	9.2	Be	917	11.6	Pt	919	8.1	Hf	950	8.5	Sh
918	7.9	Dl	948	8.2	Dl	913	9.0	Rc	918	12.4	Cm	920	7.9	Bk	950	8.5	Bc
918	8.0	Cm	948	8.3	Gy	914	9.0	Hk	918	11.9	Md	920	7.8	Rc	951	8.2	Sa
919	7.8	Hf	948	8.0	Hf	914	9.1	Ah	918	12.2	Jo	922	7.9	Mc	951	8.3	Hv
920	8.1	Bk	949	8.1	Sq	915	9.3	Sq	919	11.6	Hf	923	7.8	Bc	951	8.4	Ah
920	8.1	Es	949	8.0	Mc	916	9.4	Fs	919	12.3	Ry	923	7.8	Hv	951	8.5	Bc

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S UMA			RV VIR			R HYA			T CEN			RR VIR			U UMI		
123961			*130212*			*132422*			*133633*			*135908*			141567		
951	8.5	Mc	899	13.2	Hk	925	7.6	En	925	7.5	Lt	942	11.5	Sf	870	10.2	Ch
952	8.5	Hv	900	13.8	Ch	926	7.9	Kd	927	7.1	En	943	11.6	Hk	885	10.2	Ks
952	8.8	Gy	930	14.2	Wp	927	7.8	Kd	928	6.7	Kd	947	11.6	Sf	895	11.1	Ah
952	8.5	Bc	930	14.1	Wa	928	7.8	Kd	932	6.6	En	947	11.4	Gy	899	10.8	Hk
953	8.6	Hv	947	12.5	Gy	935	7.0	Jo	RT CEN			948	11.5	Gw	903	10.7	Jo
953	8.8	Dl	U OCT			937	7.1	Jo	*134236*			948	11.6	Ie	903	10.5	Ks
953	8.3	Wp	*131283*			955	7.0	Jo	870	11.7	Bl	963	12.0	Gy	910	11.3	Ra
953	8.4	Hf	870	10.8	Bl	956	7.2	Jo	886	11.6	Bl	Z BOO			917	11.8	Pt
954	8.6	Hv	886	10.6	Bl	S VIR			892	12.4	En	140113			917	11.4	Sf
954	8.8	Gy	892	9.4	En	*132706*			892	11.7	Ht	901	10.7	Br	917	11.7	Hf
954	8.7	Bc	892	10.2	Ht	892	12.0	Ht	897	12.6	Bl	901	10.3	Ch	918	11.4	Jo
955	8.7	Gy	896	9.4	En	898	12.0	Ht	898	12.2	Ht	907	11.1	Gy	918	11.0	Kn
955	8.5	Fa	897	9.5	dK	905	12.0	Ht	899	12.4	En	931	12.1	Wp	919	11.8	Ch
955	8.3	Jo	898	9.5	Ht	916	12.1	Ht	905	12.4	Ht	931	12.4	Wa	921	11.5	Jo
956	8.6	Dl	897	9.7	Bl	917	12.6	Pt	916	12.4	Ht	932	12.1	B	923	11.9	Cm
956	8.7	Hf	904	9.3	dK	919	13.2	Ch	917	12.8	Bl	933	12.2	Hk	929	11.7	B
960	9.0	Dl	909	8.8	dK	926	12.3	Ra	924	12.4	En	944	13.1	Gy	931	11.8	Hf
960	8.7	Fa	915	8.4	dK	930	13.0	Wp	R CVN			947	12.8	Hk	931	12.0	Wp
961	8.4	Jo	916	8.8	Ht	930	13.0	Wa	134440			951	13.2	Ie	931	11.9	Wa
963	9.0	Gy	917	8.5	Bl	930	12.5	B	870	11.5	Ch	Z VIR			932	12.0	Md
965	8.9	Lr	918	8.2	En	RV CEN			885	11.3	Ks	*140512*			945	11.9	Hf
965	9.1	Kg	924	8.5	En	*133155*			901	12.1	Ch	899	11.5	Hk	946	11.8	Sf
RU VIR			V CVN			870	9.1	Bl	903	12.4	Jo	919	13.8	Ch	946	12.2	Md
124204			131546			886	8.7	Bl	903	12.3	Ks	930	14.3	Wp	948	11.9	Wp
901	13.0	Br	916	8.0	Lt	892	8.6	En	912	12.4	Ra	949	13.2	Ie	948	11.8	Hi
913	13.1	Be	V VIR			892	9.1	Ht	915	12.3	B	RU HYA			948	11.8	Hf
917	13.3	Pt	*132202*			897	8.5	Bl	917	12.0	Pt	*140528*			948	12.0	Kn
918	13.4	Br	901	13.2	Ch	898	9.0	Ht	918	12.3	Kn	870	9.3	Bl	949	12.0	Wa
943	13.3	Hk	948	9.0	Hf	905	8.8	Ht	924	12.3	Hf	886	8.4	Bl	953	11.5	Wp
943	13.4	Ar	R HYA			916	8.5	Ht	932	12.3	Wp	892	7.9	En	954	11.7	Cl
U VIR			*132422*			917	8.2	Bl	935	12.0	Bs	892	8.2	Ht	955	12.2	Fa
124606			870	8.7	Bl	924	8.0	En	942	12.0	Hf	897	7.8	Bl	955	11.9	Hf
899	12.1	Hk	870	8.1	Ch	932	7.8	En	953	11.4	Hf	898	8.0	Ht	960	11.7	Fa
900	12.4	Ch	885	8.2	Ks	T UMI			RX CEN			899	7.9	En	S BOO		
901	12.2	Br	886	7.5	Bl	133273			*134536*			905	8.2	Ht	141954		
917	12.7	Md	892	7.8	En	913	14.5	Pf	890	13.1	Bl	916	8.0	Ht	870	8.8	Ch
917	11.9	Hi	892	7.9	Ht	922	13.7	Pf	899	13.1	En	918	8.2	Bl	899	8.2	Kt
917	11.8	Pt	895	7.9	Ch	923	13.4	Cm	905	13.1	Ht	925	8.5	En	901	8.0	Br
918	12.0	Br	897	7.5	dK	923	14.0	Br	916	12.3	Ht	927	8.4	En	901	8.1	Ch
918	11.8	Cl	897	7.6	Bl	948	12.8	Cl	918	12.5	Bl	R CEN			903	8.1	Ks
923	11.8	Wp	898	7.8	Ht	955	12.4	Kn	924	11.0	En	*140959*			903	8.2	Jo
924	11.0	Jo	899	7.8	En	T CEN			927	9.5	En	870	6.5	Bl	905	8.3	Kt
925	11.8	Md	903	7.6	Jo	*133633*						886	6.7	Bl	906	8.3	Cl
927	10.8	Jo	904	7.4	dK	870	6.4	Bl	T APS			892	6.4	En	906	8.2	Kt
930	11.3	Wp	905	7.8	Ht	886	6.5	Bl	*134677*			892	6.6	Ht	907	8.0	Gy
931	10.2	Fs	909	7.3	dK	892	7.4	En	890	13.2	Bl	897	6.8	Bl	912	8.2	Hf
932	11.1	Cl	915	7.2	dK	892	7.7	Ht	899	12.7	En	897	6.4	dK	912	8.3	Sh
932	11.1	B	916	8.6	Kd	897	7.6	Bl	918	13.2	En	898	6.6	Ht	913	8.2	Kt
933	11.0	Hk	916	7.8	Ht	898	8.1	Ht	RR VIR			899	6.2	En	914	8.3	Kt
934	11.2	Wp	917	7.5	Bl	899	7.8	En	*135908*			904	6.4	dK	915	8.5	Sq
934	11.0	Wa	917	8.0	Pt	905	8.6	Ht	914	11.3	Hk	905	6.6	Ht	915	8.2	Kt
942	10.0	Hf	918	7.8	En	916	8.0	Lt	917	11.4	Pt	909	6.4	dK	917	8.6	Dl
946	9.8	Cl	918	7.5	Jo	916	8.5	Ht	923	11.0	Sf	915	6.6	dK	917	8.3	Pt
948	9.9	Hi	919	7.5	Ch	916	7.7	Kd	929	11.4	B	916	6.8	Ht	918	8.5	Jo
950	9.7	Md	920	8.5	Kd	920	6.9	Kd	930	11.2	Wp	918	7.3	Bl	918	8.7	Kn
953	9.5	Hf	921	7.4	Jo	921	8.0	Lt	930	11.3	Wa	924	7.3	En	918	8.7	Dl
955	9.6	Jo	924	8.3	Kd	924	7.1	En	931	11.0	Ie	927	7.0	En	920	8.3	Hf
961	9.3	Jo	925	8.2	Kd	925	6.8	Kd	933	11.4	Hk	932	6.9	En	920	8.4	Cl

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S Boo			V Boo			R Cam			X Lup			T Lib			RU Lib		
141954			142539			142584			*144646b*			*150519*			*152714*		
920	8.5	Kt	914	9.5	Ah	918	11.7	Kn	892[	12.1	En	917[	12.0	Pt	953	9.4	Bu
920	8.4	Wd	915	9.5	Sf	921	11.0	Jo	905[	12.1	Ht	Y Lib			948	9.2	Hk
921	8.7	Jo	915	9.4	Sq	927	11.5	Io	925[	12.1	En	*150605*			955	9.5	Hf
922	8.3	Kt	917	9.9	Hf	929	12.0	Br	U Boo			917[	12.6	Pt	955	9.6	Jo
923	8.7	Ra	917	9.6	Pt	931	12.2	Wp	144918			956	8.8	B	R Nor		
924	8.7	Jo	918	9.5	Jo	931	12.0	Wa	898	10.8	Fc	959	9.9	Es	*152849*		
928	9.2	Kt	918	9.4	Kn	944	12.2	Gy	907	10.3	Gy	S Lib			870	7.5	Bl
930	9.1	Pg	918	9.7	Dl	948	12.0	Kn	918	10.1	Cl	*151520*			886	7.2	Bl
930	9.2	Cl	920	9.8	Wd	R Boo			922	10.0	Ch	899	9.6	Hk	892	7.8	Ht
931	8.1	Dl	924	9.4	Jo	143227			929	10.2	B	917	9.6	Hf	897	6.9	Bl
931	9.0	Wp	924	9.4	Ah	874	11.9	Ch	932	10.4	Cl	917	10.5	Pt	898	7.9	Ht
931	9.0	Wa	927	9.8	Ah	901	12.6	Ch	933	10.4	Hk	934	11.7	Wp	905	8.0	Ht
932	9.2	Kt	927	9.4	Jo	913	12.2	Ch	938	10.1	B	934	11.9	Wa	916	8.7	Ht
933	9.3	B	929	9.7	Ah	917	11.0	Dl	944	10.3	Gy	S Ser			918	8.7	Bl
933	9.3	Hk	931	9.9	Hf	917	11.7	Pt	947	10.2	Hk	151714			925	8.7	En
933	9.3	Wp	931	9.3	Jo	917	11.5	Hf	948	10.1	Cl	930	13.4	Br	X Lib		
933	9.2	Kt	931	9.7	Sf	918	12.0	Jo	955	10.3	Gy	934	13.8	Wp	*153020*		
934	9.4	Cm	931	9.9	Dl	918	11.2	Dl	Y Lup			934	13.8	Wa	890	11.7	Bl
937	9.9	Kt	931	9.9	Hm	920	11.6	Hf	*145254*			948	13.4	B	897	11.8	Bl
938	9.5	Gy	931	9.9	Wp	920	11.8	Wd	870	9.9	Bl	S CrB			918	11.3	Bl
940	10.0	Kt	931	9.7	Wa	924	10.6	Ah	886	10.0	Bl	151731			934	12.0	Wp
940	9.8	Hf	932	9.9	Hm	924	11.8	Jo	892	10.1	En	895	12.4	Ch	934	11.9	Wa
943	9.5	Kt	932	9.8	Ah	927	10.8	Ah	892	10.0	Ht	901	12.7	Br	948	12.0	Hk
944	9.8	Pg	932	10.4	Dh	929	10.7	Ah	897	10.5	Bl	910	11.9	Ra	W Lib		
945	9.8	Kt	932	10.0	Gw	929	10.8	B	898	10.5	Ht	917	12.6	Pt	*153215*		
946	9.8	Kt	933	9.5	B	932	10.6	Ah	905	10.7	Ht	918	13.0	Br	890[	13.1	Bl
947	10.5	Kt	933	9.7	Ah	933	10.4	Ah	916	11.0	Ht	919	12.4	Ba	918	12.5	Bl
947	10.0	B	934	9.7	Dl	933	10.8	Hk	918	10.7	Bl	929	13.2	B	934	11.8	Wp
947	9.9	Kn	934	9.8	Hm	934	10.3	Hf	924	11.2	En	932	13.3	Ar	934	11.7	Wa
947	10.2	Hk	940	9.8	Dh	934	11.5	Rb	S Aps			934	13.1	Wa	S UMi		
947	10.1	Gy	940	9.6	Hf	938	9.8	B	*145971*			934	13.1	Wp	153378		
948	10.4	Cl	941	9.7	Dh	940	9.9	Rb	870[	13.4	Bl	935	13.1	Bs	870	9.3	Ch
948	9.6	Kt	943	9.6	Ah	942	9.9	Hf	886[	13.4	Bl	946	12.0	Dh	895	9.4	Kp
949	10.0	Sq	944	9.5	Ah	943	9.8	Ah	890[	13.4	Bl	965	13.0	Pc	901	9.7	Ch
949	10.2	Hb	944	9.7	Sf	944	9.8	Ah	892[	13.4	En	RS Lib			903	8.4	Jo
951	10.5	Kt	946	9.6	Dh	946	9.8	Ss	897	13.5	Bl	*151822*			907	8.9	Gy
953	10.7	Kt	946	9.3	Mc	946	9.7	Kp	898[	13.4	Ht	890	12.8	Bl	910	9.4	Ra
954	10.8	Kt	947	9.5	Kn	947	9.4	Hk	905[	13.4	Ht	892	12.4	Ht	915	9.2	Sq
955	10.4	Hf	948	9.8	Dh	948	9.5	Kp	916	13.5	Ht	897	12.6	Bl	915	8.9	Sf
963	10.9	Gy	948	9.3	Gw	949	9.2	Sq	918	12.9	Bl	898	12.4	Ht	917	9.7	Hf
RS Vir			949	9.2	Sq	950	9.2	Ah	924	12.5	En	918	10.5	Bl	917	8.6	Pt
142205			950	9.3	Sh	951	9.2	Ah	925	12.2	En	925	10.6	En	918	9.2	Dl
903	13.9	Ks	950	9.2	Ah	954	9.3	Es	932	11.8	En	933	10.4	Hk	918	9.6	Jo
943	13.4	Hk	951	9.2	Ah	955	9.4	Hf	RT Lib			934	10.0	Wp	921	9.9	Jo
943	13.4	Ar	951	9.3	Gw	958	9.3	Es	*150018*			934	10.0	Wa	923	9.6	Cm
956	13.4	Es	953	9.5	Sf	V Lib			917	10.0	Hf	RU Lib			930	9.7	Pg
V Boo			955	9.3	Hf	*143417*			917	10.3	Sf	*152714*			931	9.6	Gy
142539			956	9.0	Io	920	11.4	Cl	917	10.0	Pt	899	9.3	Hk	931	9.8	Sf
870	9.4	Ch	961	9.2	Jo	948	11.5	Hk	922	10.2	Ch	916	8.3	Lt	934	10.0	Dl
898	9.1	Ah	965	9.0	Wd	949	11.2	Hf	924	9.8	Jo	917	8.6	Hf	934	9.8	Wp
901	9.5	Ch	R Cam			953	10.4	Cl	932	10.8	B	917	8.1	Pt	934	9.6	Wa
903	9.3	Jo	142584			S Lup			934	10.7	Wa	921	8.8	Lt	934	10.0	Hf
904	9.1	Ah	870	10.4	Ch	*144646a*			934	10.7	Wp	933	8.8	B	938	10.3	Dl
905	9.4	Dh	895	11.1	Br	892[	12.1	En	934	10.5	Hf	934	8.7	Wp	944	10.2	Pg
910	9.6	Ra	903	10.9	Jo	905[	12.1	Ht	944	11.2	Sf	934	8.7	Wa	944	9.8	Sf
912	9.6	Dh	906	11.5	Br	916	12.2	Ht	948	11.2	Hk	934	8.6	Hf	945	9.9	Hf
913	8.6	Mc	907	11.3	Gy	925	12.5	En	948	11.7	B	944	9.1	Hf	946	9.9	Ah
914	9.6	Dh	918	10.7	Jo				955	8.8	Jo	944	9.1	Wd	948	10.5	Dl

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S UMi			R CrB			R CrB			R CrB			R CrB			R CrB		
153378			154428			154428			154428			154428			154428		
948	10.4	Ah	896	10.4	Fc	913	9.0	Wp	921	9.1	Pt	934	8.6	Hm	946	8.4	Lf
948	10.0	Wp	898	9.4	Ar	913	9.0	Pt	921	9.0	Jo	934	8.4	Sa	946	8.2	Wa
948	10.0	Hf	898	9.6	Hu	914	8.9	Pb	922	8.9	Ch	934	8.2	Rb	946	7.9	Ar
949	9.8	Wa	898	9.6	Pb	914	9.0	Ah	923	8.8	Ra	934	8.4	Hf	947	8.0	Dh
950	10.5	Dl	898	10.2	Ch	914	8.7	Bk	923	9.1	Wa	935	8.7	Ah	947	8.2	Hf
951	10.1	Bc	898	9.8	Pb	914	9.0	Pt	923	8.9	Wp	935	8.2	Br	947	8.2	Jo
951	10.0	Hv	898	10.1	Ah	914	9.3	Hk	923	9.0	Br	935	8.5	Kp	947	8.5	Gy
952	10.2	Ah	899	9.5	Dh	914	8.8	Ar	923	9.6	Cm	935	8.4	Jo	947	8.1	Dl
952	9.8	Hv	899	10.0	Pb	914	9.1	Ar	924	8.6	Hb	936	8.6	Ah	947	8.0	Bc
952	9.9	Bc	899	9.9	Ar	914	9.4	Kd	924	9.0	Br	936	8.2	Jo	947	8.0	Hv
953	10.3	Sf	899	9.9	Hk	914	9.2	Dh	924	9.2	Jo	937	8.0	Jo	947	8.3	Bk
953	9.7	Hv	900	9.9	Hf	915	9.0	Pb	924	9.0	Ah	938	8.0	Rb	947	7.8	Wa
953	10.5	Dl	901	10.2	Hu	915	9.0	Pt	924	9.0	Kd	938	8.5	Dl	947	7.7	Wp
953	10.3	Wp	901	10.0	Fc	915	9.0	Ar	924	9.1	Hf	938	8.4	Wd	948	8.1	Sa
954	10.4	Ah	901	9.7	Ar	916	9.0	Wa	924	8.8	Rc	940	8.5	Sz	948	8.2	Hf
954	9.7	Hv	902	9.9	Ar	916	9.2	Wp	925	8.9	Br	940	7.7	Dh	948	8.1	Kp
954	9.7	Bc	902	10.5	Fc	916	9.4	Rb	925	8.0	Dt	940	8.3	Rb	948	8.2	Gy
955	9.4	Fa	903	9.5	Jo	916	9.4	Bk	925	9.0	Kd	940	8.5	Wa	948	8.1	Rb
956	10.2	Hf	903	9.8	Fc	916	9.1	Kd	925	9.0	Ah	940	8.7	Wp	948	8.1	Hb
956	10.5	Dl	903	10.3	Br	917	9.0	Pt	926	8.9	Kd	940	8.5	Hf	948	8.0	Ar
956	10.6	Ah	903	10.0	Rb	917	9.2	Fa	927	8.9	Jo	941	8.3	Kg	948	8.2	Gw
960	10.5	Fa	904	9.8	Ah	917	8.9	Sq	927	8.9	Ah	941	7.9	Dh	949	8.3	Hf
963	10.6	Ah	905	10.0	Fc	917	8.8	Rc	927	9.6	Kd	941	8.7	Dl	949	8.0	Sa
U Lib			905	8.8	Ar	917	9.0	Ie	928	8.8	Ah	941	8.3	Sa	949	8.1	Rb
153620a			906	9.7	Br	917	9.3	Kd	928	8.9	Kd	941	8.8	Wa	949	8.2	Ie
890[	12.9	Bl	906	9.2	Ar	917	9.3	Rb	928	8.7	Ar	941	8.2	Ar	949	8.0	Wa
918[	12.9	Bl	906	9.8	Fc	917	9.3	Wd	929	8.7	Br	942	8.3	Rb	949	7.8	Wp
934[	13.5	Wp	906	9.2	Pb	917	9.0	Kp	929	8.8	Ah	942	8.2	Kp	950	8.1	Ah
T Nor			906	10.3	Kd	917	9.4	Dl	930	8.6	Wa	942	8.7	Dl	950	8.0	Dl
153654			907	10.0	Fc	917	9.3	Hf	930	8.9	Wp	942	8.2	Jo	950	8.2	Bc
892	9.3	Ht	907	9.9	Gy	918	9.2	Sh	930	8.7	Rc	942	8.4	Hf	950	8.2	Pg
898	9.9	Ht	909	9.5	Fc	918	9.3	Br	930	8.6	Pg	942	8.2	Sa	950	8.1	Kp
905	10.4	Ht	909	9.5	Ks	918	9.2	Rb	930	8.6	Pt	943	8.0	Ar	950	8.2	Sh
916	10.5	Ht	910	9.4	Ra	918	9.3	Kp	931	8.8	Jo	943	8.5	Gv	950	8.1	Rb
925	10.8	En	911	9.7	Rb	918	9.4	Dl	931	8.9	Ah	943	8.8	Fa	950	8.3	Hf
RR CrB			911	9.5	Fc	918	9.1	Hf	931	8.9	Hf	943	8.4	Jo	950	8.2	Sq
153738			911	9.6	Hf	918	8.8	Ba	931	8.8	Hm	943	8.5	Ah	951	8.1	Bc
906	8.0	Lt	911	9.3	Pb	918	8.9	Ar	931	8.7	Rb	943	8.3	Hk	951	8.4	Sa
913	8.0	Lt	911	9.7	Cm	918	9.2	Jo	931	8.5	Gy	944	8.2	Wd	951	8.1	Ar
925	7.8	Lt	911	8.8	Fa	918	9.0	Pt	931	8.5	Wd	944	8.4	Ah	951	8.0	Hk
933	7.8	Lt	911	9.3	Ks	919	9.3	Kd	931	8.5	Fs	944	8.3	Pg	951	8.2	Ah
Z Lib			912	9.2	Ks	919	8.8	Wa	931	8.8	Dl	944	8.5	Gy	951	8.1	Hv
154020			912	9.1	Fc	919	9.0	Pt	931	8.4	Ie	944	8.4	Hf	951	7.8	Wa
890[	12.7	Bl	912	9.8	Rb	919	9.2	Hf	932	8.7	Gw	944	8.2	Wa	951	8.1	Gw
918[	12.7	Bl	912	9.1	Ar	919	8.5	Wp	932	8.5	Ar	944	8.2	Rb	952	8.2	Bc
R CrB			912	9.7	Sz	920	9.0	Ks	932	8.9	Ah	944	8.1	Wp	952	8.1	Gy
154428			912	9.5	Hf	920	9.1	Kd	932	8.7	Hm	945	8.0	Ar	952	8.2	Hv
685	5.9	Me	912	9.8	Sh	920	8.9	Jo	932	8.6	Pb	945	8.0	Pb	953	8.0	Dl
717	6.3	Me	912	9.0	Pb	920	8.8	Ar	932	8.0	Fa	945	8.4	Hf	953	8.3	Wd
718	6.2	Me	913	9.4	Ah	920	9.0	Br	933	8.4	Hf	945	8.1	Gy	953	8.1	Rb
724	6.1	Me	913	9.0	Lf	920	9.0	Wa	933	8.2	Pt	945	8.2	Ac	953	8.1	Bk
725	6.1	Me	913	9.1	Pb	920	9.1	Hf	933	8.8	Ah	945	8.2	Jo	953	8.3	Wp
870	9.0	Ch	913	8.9	Rc	920	9.3	Pt	933	9.0	Wp	946	8.2	Ss	953	8.0	Hv
888	9.6	Ch	913	9.0	Ar	920	8.9	Rc	933	8.4	Ar	946	8.0	Gy	953	8.2	Hf
893	9.9	Me	913	9.6	Ch	920	9.1	Wd	933	8.5	Wd	946	7.9	Dh	954	7.8	Ar
895	9.4	Pb	913	10.0	Kd	920	9.5	Cm	933	8.4	Gi	946	8.0	Hu	954	8.0	Bc
895	9.4	Ar	913	9.2	Wa	920	9.0	Wp	934	8.5	Dl	946	8.3	Hf	954	8.0	Hv
895	10.1	Fc	913	9.7	Cm	921	9.2	Br	934	8.2	Ie	946	8.1	Kp	954	8.1	Gy

Variable Star Observations Received During May and June, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R CrB			V CrB			RZ Sco			U Ser			RU Her			S Sco		
154428			154639			*155823*			160210			160625			*161122b*		
954	7.9	Wa	930	8.9	L	892	10.9	Ht	944	13.5	L	917	10.4	Wd	956	11.5	Jo
954	7.8	Wp	931	10.0	Jo	897	11.4	dK	956	13.2	B	918	10.5	Sq	W CrB		
955	8.3	Gy	932	10.5	Ar	898	11.0	Ht	X Sco			918	9.7	Jo	161138		
955	8.1	Hf	934	10.7	Wp	904	11.7	dK	*160221a*			920	9.5	Jo	918	11.6	Br
955	8.0	Hb	934	10.7	Wa	924	12.0	Jo	890	11.4	Bl	922	10.0	Ch	918	10.6	Jo
955	8.1	Rb	934	10.5	Pb	927	12.1	En	897	11.0	Bl	923	10.0	Sf	918	11.6	Md
955	7.8	Jo	934	10.3	Hf	932	12.2	Hk	899	10.9	Hk	923	9.6	Ra	920	11.5	Pt
955	7.7	Wa	935	9.3	Jo	946	11.5	Hk	932	11.0	Hk	924	9.6	Jo	920	10.6	Jo
955	8.0	Wp	937	9.0	Jo	946	11.7	Kn	946	11.9	Hk	927	9.4	Jo	924	10.4	Jo
956	8.1	Hf	940	10.1	Wp	Z Sco			SX Her			929	9.2	Br	927	10.6	Jo
956	8.2	Gy	940	10.3	Wa	*160021*			160325			931	9.5	Gy	929	11.1	Md
956	7.9	Dl	943	9.2	Jo	890	11.0	Bl	893	8.0	Me	933	9.8	Wp	931	11.0	Sf
956	8.0	Jo	945	10.3	Hf	892	11.0	Ht	903	8.5	Jo	934	9.9	Ie	932	10.8	Ar
960	7.8	Dl	946	9.5	Mc	897	11.0	Bl	913	8.8	Lt	934	8.0	Hm	933	10.9	Kg
960	7.8	Wp	946	10.1	Wa	898	10.9	Ht	913	8.1	Pt	934	9.5	Hf	933	11.2	Cm
960	7.5	Wa	947	9.8	Es	924	9.9	Jo	914	8.2	Pt	935	9.4	Jo	933	10.7	B
960	8.8	Fa	948	10.0	Hf	925	9.9	En	915	8.3	Pt	937	9.5	B	934	11.1	Hf
961	7.6	Wp	948	10.5	Wp	946	10.0	Hk	917	8.2	Pt	942	10.1	Rb	935	10.4	Jo
961	7.8	Jo	948	10.3	Hi	948	9.7	Gw	917	8.4	Hf	944	10.0	Pg	937	10.0	Jo
963	8.1	Gy	949	10.2	Md	956	9.3	Jo	917	8.9	Wd	944	10.0	L	940	10.6	Sz
965	7.4	Hb	949	10.2	Wa	961	9.6	Jo	918	8.5	Jo	944	10.0	Sf	942	10.1	Sf
965	7.2	Pc	950	9.5	Sq	R Her			918	8.3	Pt	945	10.1	Hf	944	10.0	L
967	7.5	Kg	951	10.0	Wa	160118			918	8.4	Sq	946	10.8	Mc	945	9.9	Hf
X CrB			953	10.3	Wp	917	10.5	Hf	919	8.2	Pt	948	10.5	Wd	947	9.8	Sf
154536			955	10.2	Wa	917	9.8	Sf	920	8.1	Pt	950	10.4	Sh	948	9.7	B
918	13.6	Br	955	9.9	Fa	917	10.3	Pt	920	8.4	Jo	953	10.3	Sf	950	9.3	Md
930	13.3	B	955	10.2	Hf	918	9.7	Jo	921	8.8	Lt	954	10.6	Gy	953	9.7	Sf
930	13.4	L	956	9.4	Es	919	10.0	Kn	921	8.1	Pt	956	10.3	Hf	956	9.0	Hf
932	13.0	Ar	960	10.0	Wa	921	9.7	Jo	923	8.2	Ra	956	9.8	Jo	956	9.6	Es
934	13.1	Wp	R Lib			923	9.6	Sf	924	8.2	Jo	961	10.0	Jo	960	9.5	Sf
934	13.1	Wa	*154715*			923	9.8	Ra	927	8.5	Jo	R Sco			W Oph		
948	12.5	Hi	899[	11.3	Hk	924	9.5	Jo	930	8.0	Pt	*161122a*			*161607*		
953	12.4	Ie	R Lup			931	9.4	Jo	931	8.3	Gy	892	10.2	Ht	899[	11.9	Hk
R Ser			*154736*			931	9.7	Gy	933	8.1	Pt	897	10.1	Bl	920[	12.0	Pt
154615			927[	12.0	En	933	9.6	B	934	8.3	Hf	898	10.3	Ht	V Oph		
901	11.6	Ch	RR Lib			934	9.6	Hf	935	8.0	Jo	898	10.7	Pb	*162112*		
917	12.6	Pt	*155018*			934	9.7	Ie	942	8.0	Rb	899	10.5	Pb	901	9.4	Ch
918	12.6	Md	917	10.6	Pt	935	9.3	Jo	944	7.8	L	899	10.4	Hk	903	8.5	Jo
925	12.3	Md	948	9.5	Hk	940	9.7	Wp	945	8.1	Hf	920	12.0	Pt	916	9.4	Bk
930	12.7	Br	955	11.5	Jo	940	9.5	Wa	946	7.9	Mc	927	12.0	En	919	9.0	Kn
930	12.7	L	Z CrB			944	9.4	L	948	8.1	Wd	932	10.9	Hk	920	9.9	Bk
934	13.0	Wp	155229			944	9.4	Gy	950	8.1	Sh	932	10.8	Pb	920	8.5	Pt
934	12.8	Wa	918	13.0	Br	944	9.5	Sf	954	8.3	Gy	946	12.9	Hk	924	8.5	Jo
957	13.4	Es	923	13.0	Ch	945	9.4	Jo	956	8.2	Hf	956[	12.5	Jo	927	8.7	Jo
V CrB			930	12.7	L	945	9.5	Hf	956	8.4	Jo	S Sco			934	9.9	Hf
154639			932	11.8	Ar	946	9.5	Ss	961	8.3	Jo	*161122b*			935	9.2	Jo
903	9.5	Jo	944	10.4	G··	948	10.0	Ar	W Sco			892	12.4	Ht	948	10.0	Hf
917	10.9	Hf	951	10.4	Sf	948	9.7	Kn	*160519*			897	12.6	Bl	948	10.0	Kn
917	9.4	Pt	953	10.2	Ie	951	9.5	Sf	897	12.3	Bl	898	12.2	Ht	956	8.8	Jo
917	10.1	Sq	954	10.2	Cl	954	9.5	Gy	899	12.1	Hk	898	12.0	Pb	U Her		
918	9.6	Jo	954	10.2	Gy	956	9.4	Es	932[	13.0	Hk	899	12.1	Pb	162119		
918	10.0	Md	956	10.2	Es	956	9.5	Hf	RU Her			899	12.2	Hk	877	11.0	Ch
920	9.7	Jo	960	10.3	Sf	956	9.4	Jo	160625			920	11.0	Pt	898	9.0	Ah
922	10.0	Ch	T CrB			961	9.3	Jo	901	11.2	Ch	924	10.4	Jo	901	8.5	Ch
924	9.8	Jo	155526			U Ser			903	11.3	Jo	927	11.1	En	903	8.7	Jo
925	10.1	Md	914	9.8	Pt	160210			917	10.4	Hf	932	12.2	Hk	904	8.0	Ah
927	9.6	Jo				899	12.8	Hk	917	10.2	Sf	946	11.3	Hk	911	7.5	Kp
930	9.8	B				922	13.2	Mv	917	9.8	Pt	948	11.4	Hf	912	7.6	Ah

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
U HER			U HER			S OPH			W HER			R UMI			TT OPH		
162119			162119			*162816*			163137			163172			164403		
912	7.4	Cm	946	7.7	Mc	897	[13.2	Bl	947	8.5	Hv	951	9.5	Bc	952	10.0	B
913	7.6	Kp	946	7.7	Ss	W HER			947	8.4	Bu	951	9.5	Hv	954	10.1	Wp
913	7.5	Kt	946	7.4	Kp	163137			947	8.8	Kt	952	9.5	Hv	954	9.9	Wa
913	7.5	Ah	947	7.6	Kt	877	11.6	Ch	947	8.4	Gw	952	9.5	Bc	955	10.1	B
914	7.4	Kt	948	7.6	Dl	895	11.1	Ar	948	8.5	Kn	954	9.7	Bc	955	9.8	Fa
914	7.5	Ah	948	7.4	Kt	895	11.1	Pb	948	8.8	Kt	954	9.6	Hv	955	10.4	Jo
915	7.5	Kt	948	8.1	Bk	901	10.1	Ch	948	8.5	Wd	965	10.5	Wd	961	10.9	Wp
917	7.4	Hf	948	7.5	Kp	903	10.2	Jo	948	8.3	Bk	R DRA			S HER		
917	7.3	Kp	948	7.9	Gw	912	9.9	Sz	948	8.4	Gw	163266			164715		
917	7.5	Sf	950	7.8	Ah	913	10.2	Kt	949	8.4	Sf	870	10.6	Ch	903	12.4	Jo
917	7.7	Wd	950	7.5	Dl	914	10.2	Kt	951	8.4	Hv	901	11.3	Ch	918	12.2	Jo
918	7.4	Jo	950	7.8	Pg	915	9.7	Bc	951	8.7	Kt	903	12.0	Jo	920	12.1	Pt
918	7.3	Kp	950	7.5	Kp	915	9.9	Hv	951	8.4	Bc	910	12.3	Ra	921	12.2	Jo
918	7.7	Dl	951	7.7	Ah	915	10.1	Kt	951	8.5	Gw	911	11.9	Wd	922	13.0	My
920	7.2	Pt	951	7.6	Kt	916	8.9	Hu	952	8.4	Hv	918	12.5	Jo	927	12.4	Jo
920	7.3	Jo	951	8.1	Gw	917	9.8	Ar	952	8.4	Bc	920	11.8	Hf	933	13.0	Kg
920	7.4	Kt	951	7.8	Lu	917	9.4	Hf	953	8.7	Kt	920	11.8	Pt	945	12.0	Jo
922	7.5	Kt	953	7.5	Dl	917	9.6	Sf	953	8.5	Dl	920	11.8	Wd	953	12.4	B
924	7.3	Jo	953	7.6	Kt	917	9.7	Dl	953	8.3	Bk	921	12.4	Jo	955	12.2	Jo
924	7.4	Ah	954	7.9	Pg	917	9.4	Wd	954	8.4	Hv	923	11.2	Wd	RS Sco		
927	7.4	Jo	954	7.6	Kt	918	9.5	Jo	954	8.7	Kt	924	12.2	Jo	*164844*		
927	7.5	Ah	954	7.8	Gy	918	8.7	Hu	954	8.4	Bc	927	12.5	Jo	886	11.3	Bl
927	7.4	L	955	7.9	Hf	918	9.6	Dl	955	8.4	Hf	943	12.3	Gy	892	11.9	Ht
928	7.4	Kt	955	8.1	Hb	919	9.2	Kn	955	8.1	Jo	946	12.3	Gy	897	11.5	Bl
929	7.5	Ah	956	8.2	Cx	920	9.0	Jo	956	8.3	Cx	948	12.5	Gy	898	11.9	Ht
931	7.5	Dl	956	7.6	Dl	920	9.6	Pt	960	8.4	Sf	948	11.9	Ar	927	12.0	En
931	7.4	Gy	960	7.7	Sf	922	9.2	Kt	961	8.6	B	948	12.0	Hf	RR Sco		
932	8.0	Hm	960	7.8	Dl	923	9.3	Sf	R UMI			949	12.0	Wa	*165030a*		
932	7.5	Ah	Y Sco			923	9.2	Br	163172			949	11.9	Wp	892	7.7	Ht
932	7.4	Kt	*162319*			924	9.2	Jo	903	9.5	Jo	950	11.0	Sq	897	7.5	Bl
933	7.6	Ah	947	[11.8	Gy	927	9.2	Jo	911	9.7	Wd	952	11.7	Gy	898	8.4	Ht
933	7.3	Kt	g HER			927	8.7	L	913	9.2	Bc	954	12.3	Gy	898	8.1	dK
933	7.2	B	162542			928	9.3	Kt	913	9.4	Hv	955	11.9	Gy	905	8.5	dK
934	7.4	Dl	906	4.4	Lt	931	8.9	Jo	915	9.7	Hv	955	11.5	Wp	909	8.6	dK
934	7.8	Hm	913	4.5	Lt	931	8.6	Dl	915	9.7	Bc	955	12.0	Fa	916	9.2	dK
934	7.5	Hf	919	4.9	Lt	932	8.4	Kt	915	9.4	Sq	956	11.9	Gy	927	10.2	En
935	7.5	Ah	925	5.0	Lt	932	8.7	Gw	917	9.6	Hf	960	11.5	Fa	SS OPH		
935	7.3	Kp	933	5.1	Lt	933	8.6	Kg	918	9.4	Jo	963	11.4	Gy	*165202*		
935	7.4	Jo	SS HER			933	8.7	Cm	918	9.7	Dl	965	11.3	Wd	920	8.9	Pt
936	7.5	Ah	162807			933	8.9	Kt	921	9.6	Jo	RR OPH			924	9.3	Jo
937	7.4	Kt	917	9.5	Hf	933	8.7	Gw	923	9.6	Cm	*164319*			927	9.3	Jo
938	7.5	Dl	917	10.0	Sf	934	8.7	Hf	923	9.9	Ra	920	10.8	Pt	935	8.5	Jo
940	7.5	Kt	918	10.0	Jo	934	8.7	Ie	924	9.4	Jo	927	10.6	En	937	8.4	Jo
941	7.5	Dl	920	10.2	Pt	935	8.4	Jo	927	9.4	Jo	934	10.7	Kn	944	9.0	Gy
941	7.4	Kt	921	10.4	Jo	937	8.6	B	928	9.4	Hv	948	10.1	Hf	954	9.1	Gy
941	7.6	Kg	923	10.0	Sf	937	8.2	Jo	928	9.4	Bc	953	9.6	Ie	955	9.2	Jo
942	7.2	Hb	924	10.8	Jo	940	8.5	Sz	931	9.9	Hm	954	9.6	Kn	958	9.4	Es
942	7.4	Kp	927	11.2	Jo	940	8.6	Kt	934	9.6	Hf	956	9.3	Jo	961	9.3	Jo
943	7.5	Ah	934	10.7	Hf	941	8.4	Dh	934	9.7	Dl	961	8.7	Jo	RV HER		
943	7.4	Kt	935	11.6	Jo	941	8.3	Kt	935	9.3	Jo	TT OPH			165631		
944	7.7	Ah	937	11.2	B	943	8.8	Kt	937	9.3	Jo	164403			906	11.7	Pf
944	7.5	Wd	942	11.4	Sf	944	8.6	Wd	943	9.5	Jo	945	9.6	Fa	918	11.5	Md
944	7.5	Hf	947	11.8	Sf	944	8.6	Hf	945	9.8	Hv	946	9.7	Hu	920	11.8	Pt
944	7.5	Sf	955	12.0	Jo	944	8.4	Sf	945	9.6	Bc	948	9.5	Hk	929	11.9	Md
945	7.6	Jo	T OPH			945	8.7	Kt	947	9.5	Bc	948	9.9	B	930	12.0	Br
945	7.4	Kt	*162815*			945	8.2	Jo	947	9.9	Hf	948	9.5	Hf	948	13.6	Ar
946	7.4	Bu	897	9.2	Bl	946	8.7	Kt	947	9.6	Hv	949	10.0	Wp	948	13.5	Ie
946	7.4	Kt	920	9.3	Pt	946	8.4	Hu	948	10.1	Wd	950	9.7	Kp	965	[12.7	Wd

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
RT Sco			**Z Oph**			**RS Oph**			**UY Dra**			**W Dra**			**W Lyr**		
165636			171401			*174406*			175458b			180565			181136		
897	13.0	Bl	927	8.0	Jo	891	11.3	Ry	940	11.5	Sz	906	9.6	Pf	930	9.0	Pt
927	13.0	En	929	8.9	Ah	892	11.5	Ht	948	12.5	Ar	913	9.1	Pf	932	8.4	Ah
TX Oph			932	8.4	Ah	898	11.5	Ht	948	11.9	Gy	914	9.2	Ar	933	8.4	Kg
165905			933	8.8	Ah	903	11.5	Ry	955	11.5	Fa	918	9.5	Jo	933	8.2	Cm
945	10.3	Fa	933	8.7	Cm	918	11.3	Jo	960	12.0	Fa	919	9.3	Kn	933	8.5	Wd
946	9.9	Gy	934	8.8	Hf	923	11.4	Ry	**RY Her**			920	9.3	Jo	933	8.6	Hf
946	10.5	Wa	935	8.2	Jo	924	11.4	Jo	175519			924	9.0	Jo	933	8.6	Ah
948	10.4	Hf	935	8.6	Ah	926	11.3	Ry	877	10.8	Ch	924	9.0	Br	935	8.3	Jo
948	10.1	Hk	936	8.5	Ah	929	11.3	Ry	901	9.4	Ch	927	8.8	Jo	935	8.5	Ah
949	10.5	Wa	937	8.3	Jo	930	11.1	Pt	920	9.5	Jo	930	9.0	Pt	935	8.3	Kp
951	10.5	Mc	944	8.2	Ah	931	11.2	Kn	924	9.3	Jo	934	8.9	Ie	936	8.5	Ah
951	10.5	Wa	947	8.4	Hf	931	11.7	Gy	927	9.3	Jo	935	9.2	Jo	937	8.1	Jo
954	10.1	Wa	950	8.2	Ah	932	11.5	Ry	930	9.0	Pt	937	9.0	Jo	938	8.3	Wd
955	10.3	Fa	951	8.2	Ah	933	11.9	Cm	931	9.2	Kn	947	8.9	Es	940	8.1	Wd
955	10.0	Gy	955	8.2	Jo	935	11.4	Ry	932	9.0	Md	948	9.3	Kn	941	8.3	Kg
955	10.2	Rb	961	8.0	Jo	944	11.7	Gy	934	9.0	Ie	948	9.3	Hf	942	8.2	Kp
960	10.5	Wa	962	8.2	Bu	946	11.9	Gy	935	9.3	Jo	954	9.2	Pf	942	8.4	Hf
R Oph			**RS Her**			952	11.8	Gy	937	9.5	Jo	**X Dra**			943	8.1	Ah
170215			171723			954	11.3	Kn	948	9.3	Kn	180666			943	8.0	Bu
876	8.2	Ch	918	12.5	Jo	954	11.8	Gy	956	9.4	Jo	914	14.4	Ar	944	8.1	Sf
899	6.5	Hk	920	13.0	Pt	955	11.4	Jo	961	9.5	Jo	934	13.5	Ie	944	8.2	Ah
901	7.0	Ch	924	12.4	Jo	955	11.7	Gy	**UW Dra**			947	12.6	Es	944	8.4	Wd
918	6.7	Jo	927	12.4	Jo	961	11.5	Jo	175554			**Nov Oph**			944	8.3	Hf
920	7.0	Bk	945	12.5	Md	963	11.7	Gy	906	7.5	Lt	180911			945	8.1	Jo
920	7.2	Pt	956	11.8	Es	**U Ara**			912	7.4	Lt	899	13.6	Ar	946	8.3	Kg
924	7.0	Jo	**S Oct**			*174551*			925	7.6	Lt	932	14.5	Ar	946	8.1	Kp
926	7.0	Ra	*172486*			892	8.5	Ht	**V Dra**			933	14.3	Ar	947	8.2	Bu
927	7.0	Jo	870	12.0	Bl	898	8.7	Ht	175654			945	13.6	Ar	947	8.3	Kg
931	9.3	Gy	886	12.8	Bl	**RT Oph**			930	13.2	Pt	946	13.5	Ar	947	8.0	Hf
934	7.5	Hf	892	12.8	En	175111			944	11.7	Gy	948	13.5	Ar	948	8.1	Kp
935	6.8	Jo	892	12.6	Ht	930	12.5	Pt	948	12.1	Ar	**TV Her**			950	8.1	Ah
937	7.3	Jo	897	13.0	Bl	**T Dra**			956	11.5	Gy	181031			950	8.2	Sh
945	8.0	Jo	898	12.9	Ht	175458a			**VX Sgr**			927	10.8	L	950	8.2	Kp
947	8.1	Gy	899	12.5	En	912	9.5	Sz	*180222a*			**RY Oph**			950	8.3	Hf
948	8.1	Hf	916	13.0	Ht	917	9.6	Hf	948	9.6	Hf	181103			951	8.1	Ah
951	8.5	Mc	924	12.8	En	918	9.0	Jo	955	8.9	Fa	906	8.8	Cl	951	8.1	Kp
953	7.6	Ie	**RU Oph**			919	9.6	Hf	955	9.5	Wp	930	11.0	Pt	953	8.1	Sf
955	8.3	Gy	172809			920	9.7	Wd	961	9.3	Wp	934	11.0	Kn	953	8.1	Bu
955	8.4	Jo	924	10.0	Jo	921	9.0	Jo	**R Pav**			934	11.5	Hf	955	8.0	Hf
955	8.0	Kn	927	9.9	Jo	923	9.8	Br	*180363*			951	11.4	Mc	955	8.0	Jo
956	8.4	Bu	930	11.0	Pt	934	9.6	Hf	892	12.3	Ht	959	12.8	Es	955	8.2	Fa
958	8.5	Es	931	11.0	Gy	940	9.0	Sz	898	12.6	Ht	**W Lyr**			961	8.2	Jo
961	8.6	Jo	935	11.0	Jo	945	9.6	Gy	**T Her**			181136			965	8.3	Kg
RT Her			948	11.9	Hf	945	9.3	Hf	180531			911	9.1	Kp	967	8.3	Kg
170627			954	12.2	Gy	946	9.7	Gy	877	10.9	Ch	917	9.1	Kp	**RV Sgr**		
914	14.8	Pf	959	12.4	Es	948	9.5	Gy	917	12.8	Wd	917	9.1	Sf	*182133*		
920	15.0	Pf	**RU Sco**			948	9.4	Ar	923	12.6	Ra	917	9.1	Wd	897	13.6	Bl
922	15.1	Pf	*173543*			948	9.3	Hf	927	12.7	L	918	9.0	Kp	d		Ser
946	15.1	Pf	897	13.1	Bl	952	9.6	Gy	930	12.6	Pt	918	9.1	Jo	182200		
RW Sco			**SV Sco**			954	9.7	Gy	931	12.6	Gy	921	9.3	Jo	905	5.2	Lt
170833			*174135*			955	9.6	Gy	948	10.7	Hf	923	8.5	Ra	**SV Her**		
897	12.0	Bl	897	12.2	Bl	955	9.3	Fa	950	9.9	Ah	924	9.0	Hf	182224		
Z Oph			**W Pav**			956	9.6	Gy	951	9.9	Ah	924	8.8	Jo	930	12.5	Pt
171401			*174162*			960	9.5	Fa	954	9.7	Gy	924	8.8	Ah	948	11.3	Ar
917	9.6	Hf	892	10.3	Ht	963	9.7	Gy	956	9.4	Jo	927	8.9	Jo	**T Ser**		
920	8.7	Pt	897	9.9	Bl	**UY Dra**			961	9.5	Jo	927	8.6	Ah	182306		
924	7.8	Jo	898	9.9	Ht	175458b			965	8.9	Wd	927	9.0	L	930	12.8	Pt
925	9.1	Ah	916	9.0	Ht	918	11.5	Jo				929	8.6	Ah			

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
SV DRA			R SCT			R SCT			NOV AQL			SU SGR			RS LYR		
183149			*184205*			*184205*			184300			*185722*			190933a		
948	13.5	Ar	917	6.9	Kp	951	5.0	Bc	945	11.0	Pb	892	8.6	Ht	930	11.4	Pt
X OPH			917	7.1	Dl	952	5.2	Hv	945	11.0	Ar	898	8.7	Ht	931	11.2	Gy
183308			917	6.9	Cm	953	5.4	Rb	946	11.0	Ar	RT LYR			931	11.3	Kn
876	7.4	Ch	918	6.5	Jo	953	5.1	Hv	946	11.0	Dh	185737			947	10.7	Gy
903	8.4	Ch	920	6.3	Bk	953	5.5	Dl	946	10.9	Pb	920	13.7	Pf	948	10.6	Kn
918	8.2	Jo	921	6.3	Jo	953	5.4	Wd	946	11.2	Lf	R AQL			955	10.7	Gy
920	8.4	Bk	922	5.5	Pb	954	5.1	Bc	947	11.0	Gy	190108			RU LYR		
921	8.2	Jo	922	5.5	Dh	954	5.9	Kg	948	10.9	Ar	875	6.8	Ch	190941		
924	8.4	Jo	923	6.0	Ra	954	5.1	Hv	948	10.9	Dh	903	8.1	Ch	930[	13.3	Pt
927	8.6	Jo	924	5.8	Jo	954	5.2	Gy	955	10.8	Gy	913	8.7	Ah	955[	12.7	Gy
930	8.2	Pt	925	5.6	Kd	955	5.7	Kg	S SCT			924	8.7	Jo	U DRA		
934	8.6	Hf	926	5.4	Kd	955	5.2	Wd	*184408*			925	9.1	Ah	190967		
935	8.2	Jo	927	5.6	Jo	955	5.6	Hb	916	7.4	Lt	929	9.4	Ah	877	9.5	Ch
937	8.2	Jo	930	5.6	Pt	955	5.6	Rb	RX LYR			930	8.4	Pt	906	10.0	Pf
945	8.4	Jo	931	5.7	Gy	955	5.7	Gy	185032			932	9.6	Ah	910	10.5	Ra
948	8.7	Hf	931	5.5	Dl	955	5.6	Jo	895	14.4	Ar	933	9.2	Hk	913	11.2	Pf
948	8.8	Kp	931	5.5	Hm	956	6.0	Gy	899	14.9	Ar	934	9.4	Hf	930	11.5	Pt
949	8.9	Hb	932	5.2	Dh	956	5.4	Jo	902	14.8	Ar	946	10.0	Hk	931	11.9	Gy
950	8.8	Kp	932	5.5	Pb	956	5.6	Kg	913	14.8	Ar	948	10.1	Hf	947	12.1	Gy
955	8.6	Jo	932	5.5	Ar	956	5.5	Dl	914	14.6	Ar	950	10.0	Ah	954	12.3	Pf
961	8.5	Jo	933	5.5	Ar	961	5.5	Jo	918	14.6	Ar	955	10.2	Jo	955	12.5	Gy
RY LYR			933	5.6	Kg	963	5.9	Gy	932	15.0	Ar	961	10.5	Jo	957	12.5	Es
184134			933	5.5	Cm	965	5.5	Pc	933	15.1	Ar	V LYR			W AQL		
898[	12.8	Pb	933	5.7	Pt	965	5.7	Kg	941	14.3	Ar	190529a			*191007*		
920	14.4	Pf	934	5.4	Hf	967	5.7	Kg	943	14.7	Ar	930[	12.3	Pt	877	10.0	Ch
930[	12.2	Pt	934	5.3	Dl	RW LYR			945	14.7	Ar	RX SGR			899	11.0	Ar
AY LYR			934	4.8	Wd	184243			946	14.5	Ar	*190818*			913	10.7	Ar
184137			935	5.3	Jo	954	13.1	Gy	948	14.9	Ar	876[	11.2	Ch	930	10.9	Pt
942[	14.0	Br	937	5.4	Jo	NOV AQL			951	14.5	Ar	898[	12.7	Ht	932	11.7	Ar
950	14.0	Pg	938	5.6	Pb	184300			954	13.8	Ar	909[	11.2	Ch	932	11.7	Gi
R SCT			939	5.7	Pb	876	11.0	Ch	R LYR			963[	12.1	Gy	933	11.9	Ar
184205			940	5.4	Dh	895	10.9	Pb	185243			RW SGR			945	11.7	Ar
685	5.3	Me	940	5.0	Hf	898	11.0	Pb	913	4.2	Mh	*190819a*			946	11.9	Ar
717	5.9	Me	941	5.5	Pb	899	10.9	Pb	923	4.2	Mh	876	10.5	Ch	948	11.9	Ar
718	5.9	Me	941	5.4	Dh	899	10.6	Dh	925	4.2	Mh	892	11.1	Ht	T SGR		
723	6.0	Me	941	5.4	Ar	899	10.6	Ar	S CRA			898	11.2	Ht	*191017*		
724	5.9	Me	942	4.7	Hb	906	10.9	Pb	*185437a*			909	10.9	Ch	876	10.0	Ch
725	5.9	Me	942	6.0	Jo	912	10.9	Pb	892	11.7	Ht	930	10.9	Pt	930	8.3	Pt
863	5.7	Ch	945	5.2	Ar	913	11.0	Pb	897	11.2	Bl	952	9.8	Gy	948	8.9	Hf
876	5.6	Ch	945	5.4	Kg	913	10.9	Ar	898	11.5	Ht	963	9.9	Gy	R SGR		
895	5.7	Pb	945	5.4	Pb	914	10.8	Ar	ST SGR			TY AQL			*191019*		
898	5.8	Pb	946	5.3	Ar	914	10.8	Dh	*185512a*			*190907*			892	11.4	Ht
899	5.7	Pb	946	5.2	Ah	914	10.8	Pb	877	10.8	Ch	899	11.1	Ar	898	11.6	Ht
899	5.9	Ar	946	5.2	Lf	918	11.0	Jo	R CRA			913	10.1	Ar	930	12.4	Pt
899	5.9	Dh	946	5.6	Pb	922	10.9	Pb	*185537a*			930	10.5	Pt	RY SGR		
903	6.2	Ch	946	4.9	Gy	924	10.8	Jo	892	11.6	Ht	932	10.9	Ar	*191033*		
906	6.8	Pb	947	5.2	Bc	930	11.2	Pt	897	11.7	Bl	932	10.9	Gi	717	7.7	Me
906	6.8	Ar	947	5.4	Dl	931	10.8	Gy	898	11.7	Ht	933	10.8	Ar	718	7.5	Me
912	6.6	Hm	947	5.2	Hv	932	10.6	Ar	T CRA			945	10.4	Ar	723	7.7	Me
912	7.1	Cm	948	5.4	Kp	932	10.6	Pb	*185537b*			946	10.4	Ar	724	8.0	Me
912	6.9	Pb	948	5.3	Hf	933	11.0	Ar	892	12.3	Ht	948	10.9	Ar	725	7.9	Me
913	6.7	Ch	948	5.3	Ar	938	10.9	Pb	898	12.7	Ht	S LYR			876	7.7	Ch
913	6.9	Ar	948	5.4	Dh	939	11.0	Pb	Z LYR			190925			892	7.6	Ht
913	6.9	Pb	948	5.5	Dl	940	10.8	Pb	185634			930[	12.3	Pt	898	7.6	Ht
913	6.7	Hm	950	5.3	Kp	940	11.0	Ar	930	11.8	Pt	X LYR			904	7.4	dK
914	7.0	Pb	950	5.5	Dl	940	10.9	Dh	947	10.9	Gy	190926			908	7.3	dK
914	6.9	Dh	951	5.3	Mc	941	11.0	Dh	955	9.8	Gy	930	8.9	Pt	915	7.2	dK
914	7.0	Ar	951	5.0	Hv	941	10.9	Pb							930	7.5	Pt

Variable Star Observations Received During May and June, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
RY Sgr			TY Cyg			R Cyg			TU Cyg			χ Cyg			Z Cyg		
191033			192928			193449			194348			194632			195849		
933	7.5	Pt	875	9.4	Ch	955	8.5	Jo	903	11.0	Ch	941	9.2	Wd	927	8.5	Jo
955	6.9	Kn	930	11.8	Pt	955	8.9	Gy	909	11.4	Ry	943	9.5	Gy	931	8.3	Jo
S Sgr			931	11.9	Gy	956	9.0	Dl	915	11.7	Ry	944	9.0	Ah	933	8.2	Pt
191319a			955	[12.4	Gy	960	9.3	Dl	923	12.1	Ry	945	8.8	Jo	934	8.6	Hf
876	[11.1	Ch	RT Aql			961	9.0	Jo	926	12.3	Ry	947	9.3	Bu	935	8.0	Jo
892	[12.7	Ht	193311			961	8.8	Bu	929	12.4	Ry	947	9.6	Gy	937	8.2	Jo
932	[11.1	Hk	878	9.2	Ch	965	8.9	Pc	932	12.7	Ry	948	9.3	Kp	945	8.2	Jo
TZ Cyg			930	11.4	Pt	RV Aql			933	12.9	Pt	948	9.7	Hf	948	8.7	Hf
191350			933	11.5	Hk	193509			935	12.8	Ry	950	9.0	Ah	955	8.5	Jo
899	10.6	Ar	R Cyg			932	13.1	Ar	X Lyr			950	9.4	Kp	961	8.7	Jo
913	11.1	Ar	193449			933	13.1	Ar	194604			951	9.6	Ah	S Tel		
914	11.2	Ar	875	7.5	Ch	933	12.1	Pt	933	12.1	Pt	953	9.4	Bk	*195855*		
914	11.2	Pb	898	6.8	Pb	946	11.1	Ar	946	10.8	Hk	954	9.0	Bc	892	12.8	Ht
918	11.4	Jo	898	7.0	Ah	947	10.5	Gy	948	10.5	Hf	954	9.0	Hv	898	12.8	Ht
924	11.5	Jo	903	7.2	Ch	948	11.0	Ar	955	9.8	Jo	955	9.0	Jo	SY Aql		
927	11.3	Jo	904	6.8	Ah	955	9.9	Gy	960	9.6	Sf	955	9.6	Gy	200212		
930	11.2	Pt	913	7.0	Ah	TT Cyg			961	9.7	Jo	956	9.6	Bu	933	[12.5	Pt
931	11.2	Gy	914	6.9	Ah	193732			χ Cyg			956	9.5	Wd	946	[12.7	Gy
932	11.2	Ar	917	7.8	Dl	919	8.2	Lt	194632			956	9.6	Dl	S Cyg		
933	11.3	Ar	918	8.0	Jo	925	8.3	Lt	774	8.8	Lu	961	9.5	Jo	200357		
934	11.0	Hf	923	7.2	Ra	933	8.4	Lt	783	9.2	Lu	964	9.6	Bu	933	12.5	Pt
935	11.4	Jo	924	7.5	Jo	T Pav			871	5.6	Ch	965	9.9	Wd	944	11.9	Gy
937	11.2	Jo	924	7.2	Ah	*193972*			877	5.7	Ch	RU Sgr			951	10.6	Mc
942	10.6	Jo	927	7.3	Ah	898	12.9	Ht	895	6.7	Ch	*195142*			954	[11.8	Gy
945	11.0	Ar	927	7.7	Jo	RZ UMa			898	7.0	Ah	892	11.6	Ht	965	11.2	Pc
946	11.0	Ar	929	7.5	Ah	194048			904	7.8	Ah	898	11.4	Ht	S Aql		
947	11.0	Gy	931	8.5	Dl	875	8.0	Ch	909	7.1	Ch	RR Aql			200715a		
948	10.7	Hf	931	7.5	Kn	895	8.8	Ch	911	7.3	Kp	*195202*			875	9.0	Ch
948	10.9	Ar	931	6.5	Gv	898	9.1	Ah	912	6.9	Hm	931	9.4	Gy	903	9.9	Ch
955	10.8	Gy	932	7.2	Ah	903	9.3	Ch	913	7.0	Hm	946	9.5	Ar	924	9.9	Jo
955	10.4	Jo	933	7.4	Ah	904	9.2	Ah	913	7.5	Ah	946	9.8	Gy	931	10.6	Gy
961	10.4	Jo	933	7.0	Pt	918	11.8	Jo	917	8.2	Kp	946	9.4	Hk	933	10.8	Pt
U Lyr			934	8.6	Wd	923	11.1	Ra	917	8.0	Dl	955	9.5	Jo	948	11.4	Hf
191637			934	8.0	Hf	924	12.2	Jo	917	8.1	Wd	RS Aql			955	11.0	Jo
920	11.5	Jo	934	8.9	Dl	925	11.6	Ah	918	8.0	Jo	*195308*			961	11.0	Jo
923	11.6	Ra	935	7.6	Jo	927	12.1	Jo	920	8.5	Kd	946	[12.9	Hk	RW Aql		
924	11.5	Jo	935	7.5	Ah	931	11.5	Gy	923	8.1	Ra	Nov Cyg			200715b		
927	11.7	Jo	936	7.5	Ah	933	12.1	Pt	924	7.7	Jo	195553			924	9.6	Jo
945	11.3	Jo	937	7.7	Jo	934	12.4	Wd	925	8.6	Kd	899	14.0	Ar	931	9.5	Gy
955	11.5	Jo	938	8.4	Wd	935	11.9	Jo	925	8.2	Ah	913	13.3	Ar	933	9.3	Pt
955	10.3	Fa	938	8.5	Dl	938	12.5	Wd	927	7.7	Jo	913	13.4	Pb	955	9.6	Jo
965	10.4	Pc	941	8.6	Dl	943	12.4	Hk	927	8.6	Kd	914	12.9	Ar	961	9.7	Jo
UX Dra			943	8.6	Hk	943	12.0	Jo	927	8.6	Ah	932	14.4	Ar	RU Aql		
192576			943	7.9	Ah	945	11.9	Jo	929	8.5	Ah	933	14.3	Ar	200812		
906	6.8	Lt	943	8.4	Jo	946	10.5	Mc	931	8.9	Dl	945	14.1	Ar	931	10.5	Gy
925	6.6	Lt	944	7.8	Ah	948	11.7	Hf	931	7.5	Hm	946	14.1	Ar	933	9.9	Hk
AF Cyg			945	8.2	Jo	948	12.5	Gy	931	8.5	Gy	948	13.8	Ar	W Cap		
192745			946	8.6	Mc	951	10.4	Mc	932	7.8	Hm	954	13.0	Ar	*200822*		
898	7.0	Ah	947	8.8	Gy	952	12.4	Gy	932	8.5	Ah	RR Tel			933	[12.5	Pt
904	6.9	Ah	948	8.9	Dl	955	11.8	Jo	933	8.8	Ah	*195656*			Z Aql		
913	6.8	Ah	948	8.2	Hf	961	12.0	Jo	933	8.1	Pt	898	[12.6	Ht	*200906*		
914	6.9	Ah	950	9.0	Dl	963	12.3	Gy	934	7.7	Hm	Z Cyg			933	9.5	Pt
919	7.2	Kd	950	8.1	Ah	965	12.6	Pc	934	8.9	Dl	195849			946	9.3	Hk
920	6.9	Kd	951	8.2	Ah	TU Cyg			934	8.6	Hf	875	11.8	Ch	955	10.0	Jo
925	6.9	Kd	951	8.5	Mc	194348			935	7.7	Jo	903	9.1	Ch	961	10.2	Jo
927	6.9	Kd	954	8.0	Kn	875	9.8	Ch	935	8.6	Ah	918	9.0	Jo	R Sge		
			954	8.8	Hv	897	11.0	Rv	936	8.7	Ah	923	8.4	Ra	*200916*		
			954	8.9	Bc	903	11.3	Ry	937	7.9	Jo	924	8.7	Jo	924	9.5	Jo
									938	9.4	Gy						

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R SGE			SX CYG			U CYG			RU VUL			T AQR			T CEP		
200916			201130			201647			203422a			*204405*			210868		
955	9.4	Jo	933[	13.1	Pt	917	10.1	Dl	947	9.1	Gy	918	12.9	Cm	911	5.5	Ba
961	9.5	Jo	WX CYG			917	10.6	Wd	948	9.1	Hf	933	13.0	Cm	910	5.7	Ra
RS CYG			201437b			918	10.4	Dl	949	9.1	Wp	933	12.9	Pt	912	5.8	Ah
200938			774	10.1	Lu	918	9.3	Jo	951	9.1	Mc	954	11.0	Kg	912	6.6	Hm
774	8.6	Lu	783	9.9	Lu	924	9.6	Jo	954	8.9	Wp	967	10.5	Kg	913	6.7	Hm
783	8.4	Lu	875	11.6	Ch	925	10.2	Ah	955	8.9	Fa	RZ CYG			913	5.7	Ah
875	9.0	Ch	898	11.6	Pb	927	10.2	Ah	961	9.3	Wp	204846			914	6.6	Pb
878	8.9	Ch	899	11.5	Pb	927	10.0	Jo	963	9.0	Gy	933	12.0	Pt	914	5.7	Ah
898	8.4	Pb	899	11.5	Ar	929	10.3	Ah	Y DEL			S IND			917	6.4	Kp
899	8.8	Ar	903	11.9	Ch	931	10.6	Dl	203611			204954			918	5.8	Bk
906	8.3	Ar	906	11.9	Pb	931	10.2	Kn	963	12.3	Gy	898[	13.5	Ht	918	5.4	Jo
913	8.3	Ar	906	11.9	Ar	933	9.8	Pt	S DEL			X DEL			919	5.8	Ba
918	8.1	Bk	913	12.6	Ar	933	10.5	Kg	203816			205017			924	5.7	Ah
918	7.2	Jo	914	13.1	Ar	933	10.8	Cm	924	8.9	Jo	933[	12.9	Pt	924	5.0	Jo
920	8.0	Bk	917	12.3	Wd	934	10.6	Hf	927	9.0	Jo	UX CYG			925	5.6	Ah
909	8.5	Ch	918	12.6	Jo	935	9.7	Jo	933	9.5	Pt	205030a			927	5.6	Ah
923	7.8	Ra	923	12.4	Ra	938	9.9	Wd	948	9.9	Hf	944	9.9	Gy	929	5.8	Ah
924	7.3	Jo	924	12.5	Jo	945	10.0	Jo	955	10.9	Jo	954	10.4	Gy	931	5.9	Hm
927	7.2	Jo	927	12.3	Jo	946	10.4	Mc	961	10.6	Jo	R VUL			931	5.7	Ah
932	7.8	Ar	932	13.2	Ar	947	10.5	Kg	965	10.5	Pc	205923			932	5.6	Hm
932	7.8	Pb	932	13.2	Gi	947	10.5	Bc	V CYG			924	12.4	Jo	932	5.6	Ah
933	7.8	Ar	933	13.3	Ar	947	10.5	Hv	203847			929	11.0	Ah	932	6.9	Pb
933	8.1	Kg	935	12.4	Jo	948	10.7	Hf	903	11.8	Ch	932	10.5	Ah	933	5.9	Pt
933	8.4	Cm	943	12.5	Jo	948	10.5	Dl	909	11.6	Ch	933	9.8	Pt	933	5.7	Ah
933	7.2	Pt	945	13.4	Ar	950	10.6	Ah	913	12.1	Ar	944	9.3	Ah	934	5.7	Hm
934	8.2	Wd	946	13.6	Ar	951	10.3	Mc	918	10.8	Jo	948	9.1	Hf	934	6.0	Kn
934	8.6	Hf	948	13.5	Ar	951	10.8	Bc	924	10.8	Jo	950	8.8	Ah	934	6.4	Wd
935	7.2	Jo	955	12.5	Jo	951	10.8	Hv	927	10.6	Jo	951	8.7	Ah	934	6.3	Hf
941	7.8	Pb	961	12.3	Jo	952	10.1	Bc	931	9.8	Dl	955	8.1	Jo	935	5.0	Jo
943	7.4	Jo	965	13.3	Kg	952	10.5	Hv	932	10.8	Ar	961	8.0	Jo	935	6.3	Kp
944	8.0	Wd	V SGE			954	10.2	Hv	933	10.5	Pt	X CAP			935	5.9	Ah
944	8.0	Hf	201520			954	10.8	Kn	934	9.9	Dl	*210221*			936	5.8	Ah
945	7.6	Ar	899	11.3	Ar	954	10.0	Bc	935	10.0	Jo	933[	12.1	Pt	938	5.6	Dl
945	7.6	Kg	913	12.3	Ar	955	9.9	Jo	937	10.2	Jo	X CEP			940	7.3	Pb
946	7.7	Ar	914	12.4	Ar	956	10.9	Hf	945	10.4	Jo	210382			941	6.4	Wd
947	7.6	Kg	914	10.4	Pb	960	10.1	Sf	948	10.6	Hf	878[	11.1	Ch	942	6.3	Hb
947	7.2	Bc	931	11.2	Gy	961	10.0	Jo	955	10.5	Jo	895[	13.9	Br	943	5.9	Ah
947	7.2	Hv	932	10.9	Ar	965	10.7	Kg	965	10.0	Pc	929[	13.9	Br	9'4	6.0	Ah
948	7.7	Bk	932	10.9	Gi	965	11.0	Lr	Y AQR			Z CAP			945	7.3	Pb
948	8.3	Hf	933	10.9	Ar	965	10.3	Pc	*203005*			*210516*			945	5.4	Jo
950	7.0	Bu	941	10.7	Ar	Z DEL			933	11.9	Pt	933	13.0	Pt	946	7.4	Pb
951	7.2	Hv	945	10.8	Ar	202817			T DEL			R EQU			946	6.5	Mc
951	7.2	Bc	946	10.9	Ar	898[	12.9	Pb	204016			210812			946	6.6	Kp
952	7.1	Hb	948	10.9	Ar	913	13.1	Ar	948[	12.6	Hk	933[	13.5	Pt	947	6.5	Kg
952	7.2	Bc	946	11.0	Gy	932	11.8	Ar	U DEL			T CEP			948	6.4	Hf
952	7.2	Hv	952	10.3	Gy	932	11.8	Pb	204017			210868			948	6.6	Kp
954	7.6	Kg	954	11.0	Gy	933	11.5	Pt	905	7.2	Lt	774	9.3	Lu	950	6.3	Ah
954	7.2	Bc	955	10.4	Gy	947	11.2	Gy	918	6.9	Lt	872	7.9	Ch	950	5.4	Dl
954	7.2	Hv	956	10.3	Gy	963	10.3	Gy	933	7.0	Lt	895	6.2	Ch	950	6.6	Kp
955	7.3	Jo	963	10.1	Gy	ST CYG			V AQR			895	5.6	Kp	951	6.3	Ah
956	8.3	Hf	U CYG			202954			204102			895	6.2	Pb	951	6.4	Mc
956	7.5	Kg	201647			933	13.0	Pt	933	8.4	Pt	895	6.3	Ah	951	6.5	Kp
961	7.2	Jo	774	7.6	Lu	954[	12.9	Gy	934	8.7	Kn	898	6.2	Ah	951	6.5	Bu
965	8.0	Lr	783	7.5	Lu	V VUL			955	8.9	Kn	898	6.4	Pb	953	5.3	Dl
967	7.8	Kg	875	9.5	Ch	203226			V DEL			899	6.2	Pb	953	6.2	Bk
R DEL			898	9.8	Ah	933	8.9	Pt	204318			903	5.8	Jo	953	6.5	Rb
201008			898	10.2	Pb				954[	12.4	Gy	904	5.8	Ah	955	6.0	Kn
933	12.7	Pt	903	9.9	Ch							909	5.6	Ch	955	6.3	Hb

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J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
T CEP			S CEP			RV CYG			Y PEG			RW PEG			ST AND		
210868			213678			213937			220613			225914			233335		
955	5.8	Jo	935	9.5	Jo	933	6.8	Pt	952	12.5	Gy	933	9.4	Pt	933	10.0	Pt
956	5.3	Dl	937	9.5	Jo	RR PEG			RS PEG			R PEG			955	11.5	Jo
960	6.6	Bu	945	9.4	Jo	214024			220714			230110			961	11.4	Jo
960	5.2	Dl	948	11.1	Hf	933	11.5	Pt	952	12.3	Gy	933	12.7	Pt	R AQR		
961	6.0	Jo	951	9.0	Mc	952[	11.5	Gy	RS LAC			V CAS			*233815*		
965	6.7	Kg	954	10.7	Kn	μ CEP			220843a			230759			901	10.7	Ht
965	6.8	Lr	955	9.6	Jo	214058			955	11.7	Fa	895	10.0	Ah	Z CAS		
RR AQR			961	9.6	Jo	906	3.9	Lt	RY LAC			918	10.6	Jo	233956		
210903			RU CYG			925	4.1	Lt	220843b			933	11.4	Pt	918	9.5	Jo
933	13.4	Pt	213753			R GRU			955	11.1	Fa	934	9.9	Hf	934	10.3	Hf
Y PAV			897	8.1	Ry	*214247*			S GRU			TY AND			947	10.0	Gy
211570			903	8.1	Ry	901[	12.9	Ht	*221948*			231040			956	10.0	Jo
892	5.8	Ht	909	8.3	Ry	VV CEP			901	12.7	Ht	952	9.7	Gy	963	9.8	Gy
898	5.6	Ht	915	8.2	Ry	215363			R IND			955	9.4	Fa	RR CAS		
X PEG			918	8.4	Jo	906	5.5	Lt	*222867*			963	10.0	Gy	235053		
211614			923	8.4	Ry	925	5.5	Lt	889	11.5	Bl	S PEG			947	10.9	Gy
933	10.5	Pt	924	8.5	Jo	V PEG			896	11.2	Bl	231508			963	11.0	Gy
952	9.9	Gy	926	8.3	Ry	215605			901	10.9	Ht	933	11.6	Pt	R TUC		
955	9.8	Kn	927	8.5	Jo	933	11.3	Pt	917	9.8	Bl	RY AND			*235265*		
W CYG			929	8.7	Ry	U AQR			W CEP			231539			901[	13.5	Ht
213244			932	8.5	Ry	*215717*			223257			955	11.9	Wp	R CAS		
925	5.9	Kd	933	8.3	Pt	933	12.5	Pt	918	8.1	Lt	V PHE			235350		
927	5.7	Kd	935	8.4	Jo	TW PEG			925	8.1	Lt	*232746*			955	12.2	Gy
946	5.9	Mc	935	8.8	Ry	215927			T TUC			901	11.8	Ht	955	10.6	Wd
951	6.3	Mc	937	8.5	Jo	918	8.0	Lt	*223462*			Z AND			Z PEG		
S CEP			944	8.8	Ry	933	8.2	Lt	901	7.9	Ht	232848			235525		
213678			945	8.6	Jo	RY PEG			TV AND			932	10.4	Ar	933[	12.5	Pt
878	11.4	Ch	947	8.6	Hv	220133a			225342			933	10.4	Ar	952[	11.6	Gy
898	11.2	Pb	951	8.6	Hv	933	11.8	Pt	955	9.6	Fa	933	10.6	Pt	Y CAS		
903	10.2	Jo	952	8.7	Hv	RZ PEG			963	9.7	Gy	941	10.3	Ar	235855		
918	9.5	Jo	952	8.7	Bc	220133b			SZ AND			945	10.4	Ar	944	10.7	Gy
919	11.0	Kn	954	8.7	Bc	933	11.6	Pt	*225542*			946	10.4	Ar	947	10.6	Gy
919	11.1	Ba	954	8.7	Hv	T PEG			963[	12.5	Gv	948	10.6	Ar	963[	12.1	Gy
924	8.9	Jo	955	8.8	Jo	220412			VY AND			952	10.4	Gy	SV AND		
926	10.8	Ra	961	9.0	Jo	952	9.3	Gy	*225745*			963	10.5	Gy	235939		
933	9.9	Pt				955	9.4	Kn	955	10.4	Wp				933[	12.3	Pt
934	11.0	Hf							955	10.2	Fa						

RAPIDLY VARYING IRREGULAR VARIABLES.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
005840 RX ANDROMEDAE—							060547 SS AURIGAE—						
	7685.7	11.8	Me	7891.3	11.9	Fc		7883.3[	13.9	Ks	7911.5[	13.9	Wa
	7717.7	12.1	Me	7896.3	11.7	Ry		7889.4[	14.5	Ks	7912.6	14.8	Ar
	7718.7	12.1	Me	7903.6	11.6	Ry		7894.7[	13.9	Br	7913.6	14.9	Ar
	7723.7	12.0	Me	7923.6	12.1	Ry		7795.7	15.0	Ar	7913.7	14.6	Bv
	7724.6	11.8	Me	7933.9	12.9	Pt		7896.7[	13.9	Br	7914.6	14.7	Pf
	7725.6	11.7	Me	7952.8	12.3	Gy		7897.6[	12.5	Ry	7914.6	14.6	Ar
	7753.7	11.4	Me	7963.7	11.6	Gy		7898.2[	13.9	Ch	7915.6	13.7	Ar
	7864.1	11.8	Ch					7899.7[	13.9	Pf	7916.6	14.6	Wp
020356 UV PERSEI—								7901.7[	13.2	Br	7916.6	14.4	Wa
	7894.7[	13.5	Br	7896.7[	13.5	Br		7902.6[	12.5	Ry	7917.7[	12.6	Pt
	7895.7[	12.7	Br	7901.7[	12.7	Br		7903.7[	13.2	Br	7918.7[	13.8	Br
060547 SS AURIGAE—								7905.6	13.7	Ar	7919.6	14.5	Wp
	7724.7	10.7	Me	7870.2	10.9	Ch		7906.6	13.4	Ar	7919.6	14.4	Wa
	7725.7	10.8	Me	7873.2	11.3	Ch		7907.3[	12.5	Fc	7920.6	14.7	Pf
	7863.2	14.0	Ch	7877.1	11.1	Ch		7909.5[	11.5	Ry	7920.6	14.4	Ar
	7869.2	13.8	Ch	7880.2	13.0	Ch		7910.5[	11.5	Ry	7921.7[	13.0	Br

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
060547 SS AURIGAE—						
	7922.6	14.7	Pf	7931.6	11.5	Wa
	7923.6	14.5	Wa	7931.6	11.8	Kn
	7924.8	13.2	Br	7931.7	11.7	Hi
	7925.8	12.5	Br	7931.8	12.2	Br
	7926.7	12.5	Ra	7932.5	11.5	Ry
	7927.4	13.2	Ry	7934.6	13.5	Ie
	7928.6	10.8	Pf	7934.6	13.3	Wd
	7928.7	11.0	Hi	7934.6	13.5	Wa
	7929.5	10.9	Ry	7935.4	13.2	Ry
	7929.8	11.1	Br	7940.6	13.9	Wa
	7930.6	11.3	Wp	7944.6	14.2	Wa
	7930.6	11.2	Wa	7946.6	13.9	Pf
	7930.7	11.5	Hi	7947.6	14.6	Wa
	7930.8	11.6	Br	7948.6	14.4	Wa
	7931.4	11.4	Ry	7949.6	13.9	Wp
	7931.6	11.7	Gy	7954.6	12.5	Pf
	7931.6	11.7	Ie	7955.6	12.5	Gy
	7931.6	11.6	Wp	7960.6	13.0	Wp
074922 U GEMINORUM—						
	7868.2	14.0	Ch	7919.6	14.2	Wa
	7871.2	13.3	Ch	7919.6	14.3	Wp
	7875.2	12.4	Ch	7919.7	14.1	Es
	7879.2	9.4	Ch	7920.3	14.5	Ks
	7880.2	9.1	Ch	7920.6	14.0	Hr
	7884.2	9.4	Ch	7921.3	14.0	Be
	7888.2	9.9	Ch	7922.6	13.8	Wu
	7889.7	11.3	Me	7923.6	14.4	Wa
	7891.4	13.0	Ks	7923.6	14.3	Wp
	7894.7	13.8	Br	7924.8	13.3	Br
	7895.4	14.0	Fc	7925.8	13.3	Br
	7895.4	14.3	Ks	7926.3	14.2	L
	7895.7	13.8	Br	7927.6	13.8	B
	7895.7	13.9	Ar	7928.0	13.3	Kd
	7896.4	13.9	Fc	7929.8	13.3	Br
	7897.4	14.2	Ks	7930.6	13.3	Wp
	7899.1	14.1	Ch	7931.6	13.3	Wo
	7899.7	14.2	Ar	7931.8	12.4	Br
	7901.7	13.3	Br	7932.6	14.1	Ar
	7905.6	14.0	Ar	7933.6	13.6	Ar
	7906.7	13.6	Ar	7934.6	14.2	Wa
	7907.6	12.4	Gy	7935.8	12.4	Br
	7909.7	11.5	Es	7938.6	13.8	Wa
	7910.7	12.0	Ra	7940.6	13.3	Wa
	7911.6	12.5	Cm	7942.6	13.0	Rb
	7912.6	14.0	Ar	7943.6	13.3	Gy
	7913.6	14.0	Wa	7944.6	14.2	Wp
	7913.6	14.3	Ar	7944.6	14.2	Wa
	7913.7	14.0	Wu	7945.6	12.4	Ie
	7913.7	14.1	Bv	7946.6	12.6	Gy
	7914.6	14.0	Ar	7947.6	13.8	Wa
	7915.6	14.0	B	7948.6	14.3	Wa
	7915.6	14.2	Ar	7949.6	13.3	Wp
	7916.6	14.3	Wp	7954.6	11.9	Gy
	7916.6	14.3	Wa	7955.6	9.7	Gy
	7917.7	13.3	Pt	7956.6	10.0	Gy
	7918.7	13.8	Br			
080362 SU URSAE MAJORIS—						
	7894.7	11.3	Br	7896.7	13.2	Br
	7895.7	11.9	Br	7901.7	13.2	Br
080362 SU URSAE MAJORIS—						
	7903.7	12.2	Br	7929.8	13.2	Br
	7918.8	14.0	Br	7930.8	13.2	Br
	7919.8	13.8	Br	7931.8	13.2	Br
	7920.8	13.8	Br	7934.8	10.9	Br
	7923.7	13.2	Br	7935.8	10.8	Br
	7924.8	13.2	Br	7942.8	11.3	Br
	7925.8	12.7	Br	7950.7	12.0	Pg
	7926.8	13.8	Br			
081473 Z CAMELOPARDALIS—						
	7717.7	10.6	Me	7918.8	11.2	Ar
	7718.7	10.6	Me	7919.5	10.6	Ry
	7723.7	11.5	Me	7919.6	10.7	Hf
	7724.6	11.9	Me	7919.6	10.5	Wp
	7725.7	11.7	Me	7919.7	10.4	Wa
	7753.7	11.0	Me	7919.7	10.6	Pt
	7869.2	11.0	Ch	7919.8	10.4	Br
	7870.1	11.5	Ch	7920.5	10.4	Wd
	7882.4	12.4	Fc	7920.6	10.7	Ar
	7886.1	13.3	Ch	7920.6	10.5	Hf
	7889.7	10.8	Me	7920.7	10.8	Pt
	7893.7	11.7	Me	7920.8	10.3	Br
	7894.8	11.6	Br	7921.7	11.2	Pt
	7895.4	11.8	Fc	7921.8	10.4	Br
	7895.5	12.0	Ry	7922.6	10.7	Cl
	7895.7	12.0	Ar	7923.1	10.2	Ch
	7895.7	11.8	Br	7923.4	10.4	Ry
	7895.7	12.0	Pb	7923.6	10.4	Wa
	7896.4	12.1	Fc	7923.6	10.4	Wp
	7896.4	12.2	Ry	7923.8	10.4	Br
	7896.7	12.3	Br	7923.8	10.2	Md
	7897.5	12.8	Ry	7924.5	10.4	Ry
	7898.3	12.6	Fc	7924.7	11.1	Jo
	7899.7	13.0	Ar	7924.7	10.7	Hf
	7901.7	13.0	Br	7924.8	10.3	Md
	7902.6	13.2	Ry	7924.8	10.7	Br
	7903.6	13.1	Rv	7925.5	10.4	Ry
	7903.7	13.0	Br	7925.7	10.4	Md
	7905.6	13.3	Ar	7925.8	10.9	Br
	7906.7	13.3	Bv	7926.5	10.5	Ry
	7906.7	12.9	Ar	7926.8	10.9	Md
	7907.6	13.2	Wa	7926.8	11.1	Br
	7909.5	11.9	Ry	7927.5	11.1	Ry
	7910.5	11.9	Ry	7927.7	11.8	Jo
	7911.6	12.9	Wa	7928.7	11.7	Md
	7912.6	13.1	Ar	7929.8	11.8	Br
	7913.6	13.3	Ar	7930.6	12.2	Wp
	7913.6	12.7	Wp	7930.6	12.1	Wa
	7913.6	12.8	Wa	7929.6	11.7	Ry
	7914.6	13.2	Ar	7930.8	12.6	Br
	7915.4	13.0	Ry	7930.8	12.5	Md
	7915.6	13.2	Ar	7931.5	12.9	Ry
	7915.7	12.6	Pt	7931.6	12.1	Hf
	7916.6	12.1	Wp	7931.6	12.8	Wo
	7916.6	11.9	Wa	7931.6	12.8	Wa
	7917.6	10.8	Hf	7931.8	13.1	Br
	7917.7	11.1	Pt	7932.6	13.3	Ry
	7918.5	10.7	Sh	7932.6	13.3	Ar
	7918.6	10.7	Hf	7933.5	12.1	Wd
	7918.8	10.5	Br	7933.6	12.8	Ar

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Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
081473 Z CAMELOPARDALIS—						
	7933.6	12.8	Wp	7947.6	13.1	Wa
	7933.6	13.3	Ry	7948.6	13.3	Wp
	7933.6	12.2	Hf	7948.6	13.3	Ar
	7933.9	12.8	Pt	7948.7	13.3	Wa
	7933.9	12.7	Ar	7949.6	13.1	Wa
	7934.6	12.9	Wp	7949.6	12.9	Wp
	7934.6	12.7	Wa	7950.8	[12.5	Md
	7934.8	13.0	Br	7951.6	11.8	Wa
	7935.5	13.0	Ry	7951.7	12.4	Ar
	7935.8	13.2	Br	7952.8	10.7	Gy
	7938.6	12.8	Wa	7953.6	10.7	Hf
	7938.6	12.9	Wp	7954.6	10.8	Cl
	7939.5	[11.5	Ry	7954.6	10.8	Wp
	7940.7	11.1	Jo	7954.6	10.8	Wa
	7940.6	12.7	Wp	7954.6	11.1	Gy
	7940.6	12.8	Wa	7954.7	11.3	Ar
	7941.6	13.0	Wa	7955.6	10.9	Wa
	7941.6	13.0	Wp	7955.6	11.0	Fa
	7941.9	12.3	Ar	7955.6	11.2	Gy
	7942.8	13.0	Br	7955.7	10.9	Wp
	7943.6	13.3	Ar	7955.7	11.3	Rb
	7943.8	[12.5	Md	7956.6	11.7	Gy
	7944.5	13.4	Ry	7956.6	11.7	Hf
	7944.6	13.7	Wp	7956.7	12.0	Es
	7944.6	13.2	Gy	7958.8	12.2	Es
	7944.6	13.5	Wa	7959.7	12.7	Es
	7945.6	12.7	Jo	7960.6	13.2	Wp
	7945.7	13.3	Ar	7960.8	12.7	Es
	7946.6	13.3	Wa	7961.6	13.2	Wp
	7946.7	13.3	Ar	7963.7	[12.5	Gy
	7947.6	12.9	Wp			
094262 I CARINAE—						
	7891.3	4.2	En	7915.2	3.8	En
	7892.3	4.0	En	7918.4	4.0	En
	7894.4	4.2	En	7922.3	4.0	En
	7895.3	4.0	En	7924.3	3.8	En
	7896.3	3.9	En	7926.4	4.1	En
	7899.2	4.2	En	7927.3	4.2	En
	7901.3	4.0	En	7929.3	4.2	En
	7907.3	3.4	En	7931.4	4.5	En
	7908.3	3.6	En	7932.3	4.4	En
	7909.3	3.6	En	7933.3	4.1	En
094512 X LEONIS—						
	7863.1	13.3	Ch	7919.8	[13.5	Br
	7885.3	13.1	Ks	7920.8	[13.5	Br
	7894.8	13.5	Br	7923.6	[15.0	Wa
	7895.4	13.0	Ks	7923.6	[14.2	Wp
	7895.7	12.8	Pb	7923.8	[13.5	Br
	7895.7	12.8	Ar	7924.8	[13.5	Br
	7896.7	13.0	Br	7925.8	12.0	Br
	7898.8	13.2	Ar	7926.8	12.1	Br
	7899.7	13.7	Ar	7927.6	12.2	B
	7912.6	14.4	Ar	7929.8	12.1	Br
	7913.6	13.9	Ar	7930.6	12.1	Wp
	7914.6	13.9	Ar	7930.6	12.2	Wa
	7915.6	13.3	Ar	7930.8	12.0	Br
	7916.6	[14.2	Wp	7931.6	12.4	Wp
	7917.7	[12.6	Pt	7931.6	12.3	Wa
	7918.8	[13.5	Br	7931.8	12.5	Br
094512 X LEONIS—						
	7935.8	[12.3	Br	7942.8	[13.5	Br
	7943.6	12.0	Gy	7944.6	12.6	Wp
	7944.6	12.5	Wa	7946.6	[12.3	Gy
180445 NOVA HERCULIS—						
	7863.4	3.4	Ch	7864.4	4.0	Fc
	7866.7	3.8	Fc	7868.5	3.6	Ch
	7872.4	3.8	Ca	7874.4	3.7	Ch
	7876.4	3.8	Ch	7878.4	4.2	Ch
	7883.4	5.0	Ch	7888.5	4.8	Ch
	7889.4	4.2	Fc	7891.4	4.3	Ks
	7891.4	4.4	Fc	7895.4	6.4	Ch
	7895.7	6.5	Pb	7895.7	6.7	Ar
	7895.7	6.8	Hk	7895.8	6.7	Pb
	7896.5	8.2	Fc	7898.4	8.5	Fc
	7898.4	8.5	Ks	7898.7	8.8	Hu
	7898.8	8.8	Ar	7898.9	8.8	Pb
	7899.7	8.7	Hk	7899.7	8.8	Pb
	7899.8	8.6	Hk	7899.8	8.6	Ar
	7900.0	8.6	Ar	7901.2	9.2	Ch
	7901.7	9.2	Hu	7901.8	9.1	Hi
	7902.8	9.0	Ar	7903.4	9.7	Ch
	7903.6	9.8	Rb	7905.2	10.0	Kd
	7906.3	10.4	Kd	7906.8	9.6	Hi
	7906.8	10.1	Ar	7908.8	10.5	Hi
	7910.8	10.5	Ra	7911.6	10.9	Rb
	7911.6	11.2	Fa	7911.7	10.9	Cm
	7912.6	10.9	Rb	7912.8	10.6	Ra
	7913.6	10.9	Hk	7913.7	10.9	Ar
	7913.9	11.1	Ar	7914.0	11.5	Kd
	7914.8	10.6	Hk	7914.8	10.8	Ar
	7916.0	11.5	Kd	7916.7	[12.0	Hu
	7917.1	11.6	Kd	7917.7	12.2	Ie
	7917.7	12.4	Fa	7918.6	12.3	Ie
	7919.1	12.5	Kd	7920.1	12.5	Kd
	7923.7	12.6	Fa	7924.0	13.1	Kd
	7925.1	13.0	Kd	7925.3	12.7	L
	7926.1	13.3	Kd	7927.1	13.1	Kd
	7927.6	13.0	St	7927.6	13.0	Eb
	7928.0	13.0	Kd	7929.3	12.4	L
	7931.6	12.7	Eb	7931.7	12.3	Ie
	7932.6	12.3	Fa	7932.7	13.0	Ar
	7933.6	13.0	Ar	7934.6	11.6	Eb
	7934.7	12.2	Ie	7934.7	11.9	Fa
	7935.6	12.4	Bs	7937.4	11.2	L
	7937.6	10.6	Jo	7938.6	10.2	St
	7938.6	11.0	Eb	7938.6	11.4	Wd
	7938.6	10.8	Sf	7938.6	10.7	Rb
	7938.7	10.7	Gy	7940.6	11.3	Wd
	7940.7	10.5	Rb	7940.7	11.0	Pf
	7940.7	10.8	Ra	7941.6	10.4	Kg
	7941.6	10.5	Sf	7941.7	10.5	Ma
	7941.9	10.6	Ar	7942.6	10.4	Kg
	7942.6	10.2	Sf	7942.6	10.2	Jo
	7942.6	10.6	C	7942.6	10.5	Rb
	7942.8	10.7	Br	7943.4	10.4	L
	7943.6	9.7	Ar	7943.6	10.6	Eb

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
180445 NOVA HERCULIS—							180445 NOVA HERCULIS—						
	7943.6	10.2	Jo	7949.6	9.4	Hf		7965.6	8.8	Jo	7965.6	8.2	Wd
	7943.6	9.8	Hk	7949.6	9.7	Fa		7965.6	8.5	Hb	7967.6	8.3	Kg
	7943.6	9.8	C	7949.6	9.5	Sf	202946 SZ CYGNI—						
	7943.6	10.3	Gy	7949.6	9.9	Eb		7917.7	9.7	Pt	7930.9	9.2	Pt
	7943.7	10.7	Fa	7949.6	9.4	Rb		7920.7	9.6	Pt	7933.9	9.5	Pt
	7944.4	9.9	L	7949.6	9.2	Wd	213843 SS CYGNI—						
	7944.6	10.2	Sf	7949.6	9.5	Hb		7680.7	10.8	Me	7932.8	9.0	Pb
	7944.6	10.4	Gy	7949.6	9.5	Wp		7685.7	11.9	Me	7932.8	9.0	Ar
	7944.6	10.6	Wp	7949.7	9.7	Ra		7717.7	11.8	Me	7933.5	9.5	Ah
	7944.6	9.9	C	7949.7	9.3	Sa		7718.7	11.7	Me	7933.6	9.6	Kn
	7944.6	10.6	Wa	7950.6	9.5	Wd		7723.7	9.7	Me	7933.7	9.5	Pb
	7944.8	9.8	Pg	7950.6	9.3	Sh		7724.6	9.4	Me	7933.8	9.5	Ar
	7945.6	10.2	Jo	7950.6	9.3	Hf		7725.6	9.0	Me	7933.8	9.4	Kg
	7945.6	10.5	Fa	7950.6	9.6	Rb		7753.7	11.7	Me	7933.8	9.6	Cm
	7945.6	10.3	Hf	7950.7	9.1	Ra		7875.5	11.8	Ch	7933.9	9.5	Pt
	7945.6	9.9	Gy	7950.8	9.3	Pg		7878.4	12.0	Ch	7934.7	9.9	Wa
	7945.6	10.2	Eb	7950.8	9.7	Br		7895.8	12.2	Pb	7934.7	9.8	Kn
	7945.7	9.5	Ac	7951.4	10.0	L		7895.8	12.1	Ar	7934.7	10.0	Wd
	7945.7	9.7	Ar	7951.6	9.7	Fa		7898.8	12.3	Pb	7934.7	10.1	Wp
	7946.6	9.9	Gy	7951.6	9.2	Sf		7899.8	12.3	Pb	7934.8	9.8	Hf
	7946.6	10.5	St	7951.6	9.8	Ie		7899.8	12.0	Ar	7934.8	10.0	Cm
	7946.6	10.0	Sf	7951.6	9.2	Wa		7899.8	12.1	Hk	7935.4	10.1	Ah
	7946.6	9.7	Hu	7951.7	9.4	Hk		7901.8	11.9	Ar	7936.4	10.6	Ah
	7946.6	10.2	Hf	7951.7	9.3	Ar		7902.8	11.7	Ar	7937.6	11.8	Jo
	7946.7	10.4	Eb	7951.7	9.6	Gw		7905.4	11.9	Ch	7938.6	11.0	Rb
	7946.7	9.8	Hk	7952.7	8.8	Gy		7906.8	11.7	Ar	7938.7	11.5	Gy
	7946.7	9.5	Ar	7952.8	8.7	Hi		7906.8	11.7	Pb	7938.8	11.7	Pb
	7946.7	10.6	Pf	7953.6	9.7	St		7909.4	11.8	Ch	7940.6	11.6	Wa
	7946.8	9.5	Ar	7953.6	9.1	Hf		7910.9	12.0	Ra	7940.6	11.6	Wp
	7946.8	9.5	Ac	7953.6	9.2	Sf		7911.8	11.8	Pb	7940.7	12.0	Dh
	7946.8	9.9	Hk	7953.6	8.6	Rb		7912.8	11.8	Ar	7940.8	12.0	Pb
	7947.6	10.2	Eb	7953.6	9.7	Eb		7912.8	11.9	Pb	7941.8	12.0	Dh
	7947.6	9.5	Dl	7953.8	8.5	Hi		7912.8	12.2	Cm	7941.8	11.9	Ar
	7947.6	9.3	Gy	7954.6	9.5	St		7913.8	11.9	Pb	7943.7	11.7	Ar
	7947.6	9.5	Sf	7954.6	9.0	Gy		7913.8	11.9	Ar	7943.7	11.5	Gy
	7947.6	10.2	St	7954.6	9.1	Wa		7914.8	11.7	Ar	7943.7	11.6	Hk
	7947.6	10.1	Jo	7954.6	9.1	Wp		7914.8	11.7	Hk	7944.4	11.6	Ah
	7947.6	10.1	Hf	7954.7	8.5	Hi		7914.9	12.2	Pb	7944.6	11.0	Gy
	7947.6	9.4	Ar	7954.7	8.8	Ar		7914.9	12.1	Dh	7944.7	11.6	Kn
	7947.6	9.7	Hk	7955.6	9.1	Hf		7917.7	12.0	Cm	7944.8	11.8	Pg
	7947.6	9.5	Wp	7955.6	8.7	Hb		7918.6	11.5	Jo	7945.6	11.9	Jo
	7947.6	9.6	C	7955.6	9.8	Fa		7918.8	11.4	Ar	7945.7	11.7	Ar
	7947.6	9.5	Wa	7955.6	8.6	C		7919	11.0	Ma	7945.8	11.7	Pb
	7947.7	9.6	Br	7955.6	8.5	Rb		7922.7	8.3	Dh	7946.6	12.1	Gy
	7947.7	10.1	Gw	7955.6	8.7	Gy		7922.8	8.3	Pb	7946.7	12.0	Pb
	7947.7	9.6	Ma	7955.7	9.7	Jo		7923.8	8.3	Ra	7946.7	11.7	Ar
	7948.3	9.9	L	7955.8	8.4	Hi		7924	8.5	Jo	7946.7	11.8	Lf
	7948.6	9.7	Gy	7956.6	9.5	Jo		7925.5	8.4	Ah	7947.6	12.0	Gy
	7948.6	9.3	Ar	7956.6	8.7	Hf		7926.5	8.5	Ah	7947.6	11.7	Wp
	7948.6	9.3	Dl	7956.6	8.6	Gy		7927.4	8.4	Ah	7947.6	11.6	Wa
	7948.6	10.4	Rb	7956.6	8.4	Wd		7928.5	8.6	Ah	7947.7	12.0	Hv
	7948.6	10.1	Hf	7960.6	8.7	Fa		7929.6	8.7	Ah	7947.7	12.0	Bc
	7948.6	9.8	Hk	7960.6	8.8	Sf		7930.9	9.0	Pt	7948.6	12.0	Wp
	7948.7	9.9	Gw	7960.6	9.4	Wp		7931.6	8.8	Ah	7948.7	11.9	Gy
	7948.7	9.8	Ie	7960.6	9.2	Wa		7931.6	8.6	Wa	7948.7	12.0	Ar
	7948.7	9.4	Sa	7961.6	9.0	Wp		7931.6	8.7	Wp	7948.8	12.0	Hf
	7948.7	9.8	Jo	7961.6	9.2	Jo		7931.7	8.3	Gy	7949.6	12.1	Wa
	7948.8	9.3	Hi	7961.6	8.5	Hb		7932.4	9.0	Ah	7949.6	12.0	Wp
	7949.6	10.0	St	7963.6	8.2	Gy		7932.8	9.0	Gi	7950.4	11.7	Ah

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
213843 SS CYGNI—							213843 SS CYGNI—						
	7951.4	11.8	Ah	7954.6	12.0	Gy		7954.7	11.7	Ar	7960.6	12.2	Wa
	7951.6	12.0	Wa	7954.6	12.0	Wp		7955.6	11.9	Rb	7960.6	12.1	Wp
	7951.7	12.0	Hk	7954.6	12.0	Wa		7955.6	12.2	Wa	7961.6	12.1	Wp
	7951.7	12.0	Ar	7954.7	12.1	Hk		7955.7	11.9	Wp	7961.7	11.9	Jo
	7952.8	11.8	Gy	7954.7	12.0	Hv		7955.7	12.0	Jo	7963.7	12.1	Gy
	7953.6	12.0	Wd	7954.7	12.0	Bc		7955.7	12.0	Gy	7965.7	12.0	Pc

SUMMARY FOR MAY AND JUNE, 1935.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Ahnert	Ah	31	230	Kaho	Ka	1	6
Andrews, J.	Ac	3	8	Kanda	Kd	13	62
Armfield, L.	Ar	52	287	King	Kg	20	54
Baldwin	Bl	75	222	Kirkpatrick	Kp	15	71
Ballhaussen	Ba	8	12	Knott	Kt	4	58
Beck	Bv	3	3	de Kock	dK	10	37
Benini	Be	19	19	Koons	Kn	41	68
Blunck	Bu	16	35	Kotsakis	Ks	46	84
Bouton	B	54	75	Lacchini	L	22	28
Brocchi	Br	47	171	Loepfe	Lf	8	9
Brockmeyer	Bk	16	38	Loreta	Lt	30	62
Brown, S. C.	Bs	4	4	Lucas	Lu	14	22
Buckstaff	Bc	17	77	Luechinger	Lr	6	6
Callum	Cl	25	47	Marchesini	Mh	2	6
Campbell	C	1	5	Marsh	Ma	2	3
Chandra	Ch	178	365	Meek	Me	12	57
Christman	Cm	50	61	Millard	Md	40	110
Cox	Cx	3	3	McKnelly	My	10	20
Dalton	Dt	4	4	McLeod	Mc	31	55
Diedrich	Dh	13	47	Peck	Pb	35	102
Doolittle	Dl	28	130	Peltier	Pt	202	250
Eberhart	Eb	1	10	Preucil	Pf	13	30
Ellis	Es	29	48	Proctor	Pc	11	11
Ensor	En	62	209	Purdy	Pg	18	27
Farnsworth	Fa	31	52	Raphael	Ra	54	60
Fish	Fs	6	11	Recinsky	Rc	6	15
Focas	Fc	62	452	Rosebrugh	Rb	32	68
Gabris	Gi	6	6	de Roy	Ry	11	92
Gregory	Gy	105	276	Salanave	Sx	6	6
Grunwald	Gw	6	15	Seely	Sa	4	22
Haas, W.	Ha	4	19	Segers	Ss	15	30
Halbach	Hk	63	110	Shultz	Sz	13	23
Hamilton	Hm	21	63	Smiley	St	1	7
Hartmann	Hf	114	353	Smith, L.	Sh	33	42
Heines	Hh	1	3	Smith, F. P.	Sq	22	28
Hildom, A.	Hi	14	41	Smith, F. W.	Sf	24	81
Holt	Hb	13	23	Treadwell	Td	2	7
Houghton	Ht	82	238	Wade	Wh	4	4
Houston	Hu	8	15	Walton	Wu	1	2
Howes	Hv	18	117	Watson, P.	Wa	64	189
Huruhata	Hr	1	1	Webb	Wd	61	130
Iedema	Ie	26	35	Woods	Wp	74	196
Jones	Jo	127	532				
				Totals		85	474	6712

R Coronae Borealis has also recovered from its minimum of the past winter, having attained almost the seventh magnitude.

Observations on the twenty-four newly selected variables have begun in earnest. These should be made a prominent part of our observing program.

The observations contained herein are those which were received during the interval May 1 to June 15.

At the meeting of the Association, held at Mount Holyoke College, on May 25, Mr. Ferdinand Hartmann, 358 Grant Avenue, Brooklyn, New York, was appointed Chart Curator to fill the vacancy caused by the resignation of Mrs. Helen S. Hogg.

The next meeting of the Association will be held at the Harvard College Observatory on October 19.

President Ernest W. Brown, and Vice Presidents Harlow Shapley and Charles W. Elmer, and the Recorder will be the official representatives of the Association at the meeting of the International Astronomical Union, to be held in Paris, July 10 to 17, inclusive.

LEON CAMPBELL, Recorder.

July 3, 1935.

Comet Notes

By G. VAN BIESBROECK

COMET 1935*b* (JACKSON). A small unexpected comet was found by C. Jackson at the Union Observatory, Johannesburg, on June 19. The discovery was made on photographs taken in the systematic study of asteroids which is carried out at that South African observatory. The first telegraphic report received in this country on June 20 gave the following information:

> 1935 June 19.7258, Right Ascension $16^h\ 44^m\ 20^s$, Declination $-19°\ 48'$. Magnitude 13. Object diffuse without indication of tail. Daily motion west $1^m\ 52^s$ and south $4'$.

The object being far south and faint not many observations were secured, but it was recorded at the Harvard College and Yerkes Observatories, both institutions reporting the magnitude as 15 in the latter part of June. Either the magnitude was overestimated by the discoverer or the comet must have rapidly lost in brightness. When last seen here, July 16, during the total eclipse of the moon, and July 21, the magnitude was estimated as 16^M by the writer and the comet recorded as a round diffuse coma not more than 10″ in diameter. From accurate positions secured on June 21 (Yerkes), June 24 and 26 (Harvard), Whipple and Cunningham at Harvard and A. D. Maxwell at Ann Arbor have computed preliminary orbits:

	Whipple and Cunningham	A. D. Maxwell
Perihelion passage	1934 Sept. 8.380	1934 Sept. 19.8828
Node to perihelion	124° 50′	128° 30′ 56″
Longitude of node	73 17	73 14 28
Inclination	142 2	142 12 28
Perihelion distance	3.506	3.6347

The motion can be seen from the following ephemeris deduced from the first set of elements:

0^h U.T.	α	δ	—Distance from—	
	h m	° ′	Earth	Sun
1935 July 1	16 25.0	−20 24	3.5	4.4
9	12.9	20 46	3.6	4.4
17	16 2.5	21 6	3.8	4.5
25	15 53.7	24	3.9	4.5
Aug. 2	46.5	21 43	4.1	4.6
10	15 40.9	−22 1	4.3	4.6

The comet, already very far from its nearest point to the sun last September,

is receding from both the sun and the earth and this inconspicuous object will therefore soon fade away. The elements are, of course, of a provisional nature, depending on a very short interval. The last available observations show that some corrections will be necessary but that will not modify the general features of the orbit and nothing spectacular can be expected from the future of this comet. It is of interest to note that the object must have been appreciably brighter last fall and as soon as a more precise orbit is determined a retrospective ephemeris might well lead to a detection of the comet on some of last year's photographic records.

No other comets are under observation at this time. The Handbook for 1935 of the British Astronomical Association gives ephemerides of several expected periodic comets in the coming months. However, most of them are unfavorably situated in the vicinity of the sun especially for northern observers. The only exception is Holmes comet, but this object, revolving around the sun in a 7-year period, has not been seen since 1906 so that the chances of its recovery are very small.

Williams Bay, Wisconsin, July 23, 1935.

Meteor Notes from the American Meteor Society

By CHARLES P. OLIVIER, President

The past few years comprised the period during which there was reasonable hope for a fine series of showers from the Leonid stream. Coöperative plans for simultaneously observing meteors during these showers were made for the years 1931 through 1934. Thanks to the very beautiful display of November 16-17, 1931, which was unfortunately invisible to so many of our observers because of clouds, the plans for the other three years were extensive. We need not reiterate the reasons for the Leonids not coming in their hoped-for numbers, but will give a resumé of the results obtained through the efforts of numerous groups in the American Meteor Society. The final list of individual heights forms the second part of these notes. The following table gives the averages for each year and for the entire 437 meteors.

METEOR HEIGHTS

		1932 (90)* km	1933 (247) km	1934 (100) km	All (437) km
Leonids (242)*	Began	123.6 (65)*	123.6 (95)	124.5 (60)	123.9 (220)
	Ended	89.1 (79)	93.5 (98)	92.7 (55)	91.8 (232)
Sporadic Meteors (195)*	Began	119.6 (10)	103.7 (135)	111.1 (32)	105.9 (177)
	Ended	90.2 (9)	81.9 (137)	83.2 (37)	82.6 (183)

In any discussion of these averages, some remarks should be made about the errors that might be expected through systematic effects in either observation or computation. Individual heights depend, of course, upon a minimum of two observations; one fireball had as many as ten separate plots, and numerous meteors had three or four. Although all of the work was done in the United States, the assisting groups were in different parts of the country and were composed of

*The figure given in parentheses is the number of meteors in that group, year, or mean. Totals for the vertical columns should not check, as there were some meteors each year for which the height of only one end was included.

individuals of various degrees of skill in plotting. Everyone followed the same general instructions, and nearly all used the standard AMS maps (epoch 1900). Perforce the actual practice at different observing stations must have differed somewhat. Although individual plots were undoubtedly imperfect, it is difficult to believe that any *systematic* errors of observation can possibly affect the final averages.

The heights were computed here, nearly all of them by Mrs. Doris M. Wills with the aid of other members of the staff in preliminary operations, and all were finally passed upon by me. The method used is the graphical one with altitudes and azimuths, the first of three described in "Methods for Computing the Heights and Paths of Fireballs and Meteors," A.M.S. Reprint No. 11.[1] Of all methods it is the most simple and obvious, and there seems to be no way in which systematic errors could enter through its use. The azimuths are plotted on a map to scale, and the height is found by the use of the altitude from each station. This gives a separate height for each observer. The mean height for each end is then found. If for both ends the heights from the individual stations differed from this mean by more than 20% of the height itself, the contributing meteors were assumed to be actually different, and the height was not included in the accepted results. If the computed heights for only one end differed from the mean by more than 20%, but the other end gave fair agreement, the concordant end was included but the discordant end was omitted. For some meteors only one end could be computed. Such a practice of omission either of entire meteors or of one end gave no preference to high or low values, but tended to rule out meteors of doubtful identification. Time records alone will not cut them out. Rising meteors with reasonably concordant heights have not been omitted, just as negative parallaxes are not omitted from statistical discussions.

We therefore believe that we have been able, through the valuable coöperation of so many of our members, to present meteor heights in sufficient quantities and over a sufficiently extended time interval (three successive years) so that the averages have a real scientific value.

The truly wonderful agreement for the Leonids, of which each year we had enough so that the averages have definite meaning, quite exceeds our most optimistic expectations. Such good agreement would not be expected for the sporadic meteors, but even for them the results are reasonably concordant except for 1932, when so few sporadic meteor heights could be computed.

As we can hardly hope for a great Leonid display until 1964-67, we are planning no further national campaign. State groups, however, are encouraged to undertake duplicate observations whenever possible, provided they can arrange to compute their own results. Aid and advice will gladly be furnished, and any special results will be checked here. We are unable to undertake to continue height computations at headquarters for the immediate future because of the press of unworked data and other problems on hand. We will compute, as usual, the paths of fireballs for which sufficient data are reported, and we urge members not to relax in their efforts to obtain fireball and train observations.

I feel that the Leonid campaigns of the past three years have fully justified themselves, and that all who participated may feel just pride in the remarkably

[1] We have no copies of this reprint for distribution. It was originally published as *Supplement to the Pilot Chart of the North Atlantic Ocean for 1931*, November, 1931, and can be purchased through the Hydrographic Office, U. S. Navy, Washington, D. C.

accordant results that came from their observations. It is difficult to see why these heights, at least for the Leonids, should not be accepted as standard.

Meteor Heights, 1934 Leonid Epoch

PART II. STATE GROUPS, CONCLUDED

By Doris M. Wills.

Last November five A.M.S. state groups undertook coöperative observations. Results for the Wisconsin observers were given in the last Meteor Notes. The accompanying tables give heights computed from observations in Colorado, Michigan, Ohio, and Tennessee. They were computed by the altitude-azimuth method used here for all heights since November, 1932. The tables give the serial number of the meteor, the date, standard time of appearance, average estimated magnitude, the mean beginning height and the average deviation from that mean, end height and average deviation, the class of the meteor (Leonid or Sporadic), and the numbers of the stations contributing observations.

The Colorado observers, under the leadership of A. W. Recht of Chamberlin Observatory, manned three stations:

1—Denver. Personnel: A. W. Recht, T. J. Bartlett, R. Meeker, M. Filmer, W. Tait, R. Harper, A. W. Beck, Miss E. Ripple, Miss E. Schaetzel, Linkow. (Alpha Nu Astronomical Fraternity, University of Denver).

2—Boulder. Personnel: Dr. J. M. Blair (leader), A. Bernstone, Bonnie Stewart, Miss M. Yerkes, Miss R. Hoffman, D. Roper, V. R. Plumb, K. Peterson, Miss J. Gilder, L. O. Kelso, W. W. Shelby, R. Weaver, M. J. Pellillo, Miss R. Parkinson, Wayne Mock, Miss H. Bonaviez, (Alpha Nu Astronomical Fraternity, University of Colorado).

3—Colorado Springs. Personnel: Dr. G. H. Albright (leader), Miss C. Ragel, R. Lawrence, R. Switzer. (Colorado College).

All three stations observed from 14^h to 16^h on November 14-15 and 15-16. Stations 1 and 2 observed from 15^h to 16^h on November 16-17. The timing for

TABLE I

Colorado Observers.

No.	1934 Nov.	M.S.T. h m s	Mag.	Beginning Height km		End Height km		Class	Stations
1	14-15	14:32:28	3	184±	6	107±	8	S	1, 2
2		14:35:48	3	[88	31]	84	12	S	1, 3
3		15:15:49	1.5	113	4	88	14	S?	1, 3
4		15:16:41	4	78	.[1]	60	.[1]	S	1, 2
5	15-16	14:25:34	4	66	1	41	6	S	1, 2
6		14:40:00	4	69	2	27	2	S	1, 2
7		14:56:31	2	149	8	113	9	S	1, 2, 3
8		15:06:56	2	216	10	76	8	L?	1, 2
9		15:16:46	2	139	10	98	8	L	1, 2, 3
10		15:23:44	1.5	145	6	115	1	L	1, 3
11		15:37:33	2	57	6	30	0	L	1, 2
12		15:39:03	1	109	2	28	6	S	1, 2
13		15:55:00	2	90	8	[66	17]	L	1, 3
14		15:57:36	2	85	10	60	12	L	1, 2, 3
15		16:01:57	1	127	5	92	0	L	1, 3
16	16-17	15:15:45	2	62	11[2]	65	2	L	1, 2
17		15:25:23	2	72	8	45	9	L	1, 2
18		15:44:11	3	76	1	32	6	L	1, 2

[1] Graphical solution; no mean deviation found.

[2] As computed, this meteor was rising. This is obviously false, but the values are given for both ends as the deviations are less than 20%.

these stations was excellent. Their watches were checked against radio announcement by station KOA. On November 14-15 the Boulder watch was compared with the Denver watch by telephone. Time duplicates were identified and listed by Recht and measured end points were sent in with the records. His assistance appreciably simplified the computing labor here.

The heights given in brackets have deviations of more than 20 per cent. In former tables we have given only the unbracketed end. If deviations for both ends were more than 20 per cent, the results are not published, as the contributing meteors are assumed to be actually different.

In Michigan two stations observed coöperatively for 190 minutes on November 15-16, W. J. Persons (leader) near Kalamazoo and R. J. Wilson near Byron Center. Four heights are given in Table II.

TABLE II

MICHIGAN OBSERVERS.

No.	1934 Nov.	E.S.T. h m s	Mag.	Beginning Height km	End Height km	Class
1	15-16	15:03:35	0.5	88± 2	78± 0	L
2		15:14:47	0.5	104 1	76 0	L
3		16:13:07	1	176 26	122 15	L
4		16:45:18	0	158 2	93 5	L

Three of these four heights have unusually small deviations. The plotting was apparently good. As the largest time-difference from the two stations is only five seconds, the timing was excellent also.

Table III gives four heights derived from observation by two Ohio stations on November 15-16, L. La Paz near Westerville and J. L. Black at Cleveland. A third station was manned near Upper Arlington by graduate students at Ohio State University (T. Southard, F. J. Krieger, and F. M. Mallett), but their base line with Westerville was too short for satisfactory use, and they observed no duplicates with Cleveland.

TABLE III

OHIO OBSERVERS.

No.	1934 Nov.	E.S.T. h m s	Mag.	Beginning Height km	End Height km	Class
1	15-16	15:28:46	2.5	82 .[1]	71± 5	S
2		15:37:51	—0.5	184±16	113 12	L
3		15:51:16	1.5	100 13	92 9	L
4		17:09:37	0	114 .[1]	85 .[1]	L

[1] Graphical solution; no mean deviation found.

The Ohio observers under La Paz planned observations under radio control over WOSU on November 16-17, but were unfortunately thwarted by densely cloudy skies. As radio communication between stations offers the best possible means of identification of duplicates, we hope that they will be successful in a future attempt.

Under the leadership of S. Bunch at Knoxville, Tennessee, the Southern Appalachian Observers made coöperative observations from five stations:

1—Knoxville, Tennessee. Personnel: S. Bunch.
2—Harrogate, Tennessee. Personnel: H. A. Miley, C. J. Horn, O. Bonawit, and group of about 12 students, Lincoln Memorial University.
3—Cohutta, Georgia. Personnel: P. O. Parker.

4—Louisville, Kentucky. Personnel: W. L. Moore, E. Lotspeich, Miss K. Montgomery, Miss M. Schultz, Miss D. Leon, Miss E. Breitenstein, J. Baker. (Louisville Astronomical Society).
5—Jefferson City, Tennessee. Personnel: F. Weed, Jr.

On November 13-14 observations were made from stations 1 and 4, but no duplicates were plotted. Station 4 also sent in observations made on this night by C. F. Barth and O. W. McCarty at the Boy Scout Observatory. On November 14-15 and 15-16 observations were made from stations 1, 2, 3, and 4. Only stations 4 and 5 observed on November 16-17, and no duplicates were recorded.

TABLE IV

SOUTHERN APPALACHIAN OBSERVERS.

No.	1934 Nov.	C.S.T. h m s	Mag.	Beginning Height km	End Height km	Class	Stations
1	14-15	13:33:23[1]	2	96±10	77± 7	S	1, 3
2	15-16	13:23:17[2]	0.5	131 7	94 6	L	1, 3
3		13:43:17[3]	1	81 5	109 19	L	3, 4
4		13:45:27	2	[138 39]	115 10	L	3, 4
5		14:05:10	2.5	[155 71]	87 11	S	3, 4
6		14:08:03	1.5	131 10	[131 32]	L	3, 4
7		14:21:34	1	170 31	131 1	L	3, 4
8		14:21:38	2	135 9	111 5	L	3, 4

[1] Beginning and end heights of this meteor as computed by Bunch are 95±11 and 74±6.
[2] Beginning and end heights of this meteor as computed by Bunch are 134±6 and 93±8.
[3] As computed, this meteor was rising. This is obviously false, but the values are given for both ends as the deviations are less than 20%.

As in Table I, the heights given in brackets have deviations of more than 20 per cent. The identification of meteor number 5 is doubtful. Bunch computed heights for meteors number 1 and 2, as shown in the footnotes.

These 34 heights increase the total number in our files to 498, one hundred having been added by the 1934 Leonid observations. The past three years of coöperative Leonid observing have yielded heights for 437 meteors. For the 242 Leonids computed, the average height of the 220 beginning points is 123.9 km, and the average of the 232 end points is 91.8 km. For the 195 sporadic meteors, the average of 177 beginning points is 106.0 km, and of 183 end points, 82.6 km.

Flower Observatory of the University of Pennsylvania,
Upper Darby, Pennsylvania, 1935 June 14.

The Daylight Meteor of February 19, 1935

By C. C. WYLIE

The detonating meteors of 1934 for which we have recently published paths are examples of meteors for which considerable data are available. The daylight meteor of February 19, 1935, illustrates the opposite class. We received reports from only three observers of this meteor, and for only one did we obtain complete measures. A partly cloudy to cloudy sky over most of the state was no doubt responsible for the small number of observers. None was within the area where detonations would have been the most noticeable. If such were heard,

they did not attract enough attention to be reported.

The first observer was Donald Mouw, a University student at Iowa City, Iowa. At about 11:40 A.M., while the class in General Astronomy was meeting, he observed the meteor, appearing as bright in the daylight sky as the moon does in the night sky. There was no noticeable trail. He saw it through a west window of the class room, falling over the Iowa Field House. The class was dismissed at 11:50 A.M. and Mr. Mouw then told us of seeing the meteor. We had him immediately make a sketch showing the apparent path, with respect to the window frame and the Field House, as seen from this position. The angles were later measured with care, with Mr. Mouw sitting in the seat and using his drawing as a guide.

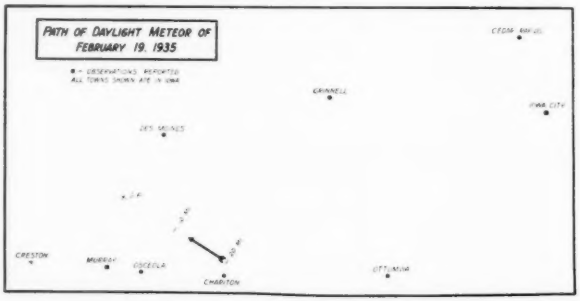
The second observer was C. J. Quackenbush of Creston, Iowa, who saw the meteor through an east window. The meteor appeared very brilliant, of a silvery color, with a large head and a long tail. The meteor appeared from behind one building, and went behind another, so he did not see the bursting. The angles for the path were measured by John W. McDonough, a civil engineer.

The third observation was reported by John A. Coleman of Murray, Iowa, as follows:

> "The meteor was observed almost directly northeast of this town. It was very bright and was travelling down, angling slightly from south to north. While still in the air the meteor exploded (no sound) and it descended in a shower of fire and sparks. Some smoke resembling steam in color was seen in the trail of the meteor and more developed after the breaking of the same."

Unfortunately, we were not able to have the angles for the Murray observation measured. Window observations are, however, the most accurate available in general. With two such observations carefully measured, one east and one west of the path, it appeared worthwhile to make the computations. The Creston measurements did not include the endpoint, but the Iowa City ones did. Further, the Murray letter supplemented the Creston measurements, being in good agreement.

Perhaps because of the limited view through a window, the meteor was not seen at either Iowa City or Creston until quite low, below 20 miles. It was then brightening up just before bursting. No determination of the duration was possible, so the heliocentric velocity was assumed parabolic.



The computations on this meteor have been made in duplicate by M. P. Roller and L. R. Wylie. The accompanying map shows the projected path of the meteor. Figures show where the path would have been when 20 miles and when 10 miles

high, but the path begins below 20 and ends before 10. All towns shown on the map are in the state of Iowa. The results are summarized in the following table.

Longitude end point	93° 30′
Latitude end point	41° 10′
Height end point	12.7 miles
Longitude appearance	93° 19′
Latitude appearance	41° 5′
Height appearance	19.1 miles
Length of path	12.8 miles
Projected length	11.0 miles
Apparent velocity	12.6 miles
Heliocentric velocity (assumed)	26.2 miles
Azimuth radiant	301°.2
Altitude radiant	30°.0
R. A. corrected radiant	11°.3
Decl. corrected radiant	—5°.2

UNIVERSITY OF IOWA, MAY 25, 1935.

Contributions from the Society for Research on Meteorites

Edited by FREDERICK C. LEONARD, President, *and* H. H. NININGER, Secretary

Some Remarks on the Program and the Needs of the Society*

By FREDERICK C. LEONARD

Because my own institution, the University of California at Los Angeles, is serving as host to the Pacific Division of the American Association for the Advancement of Science and associated societies, whose meetings on our campus are occurring simultaneously with those of the parent Association and affiliated organizations at the University of Minnesota in Minneapolis, I am, much to my regret, unable to be with you at this time, and so perforce send you this brief written message in lieu of a personal greeting.

Reviewing the progress of the year just past, the second in the Society's history, we note at the outset the Second Annual Meeting, held at the University of California, Berkeley, on June 18 and 20, 1934, in connection with the Ninety-fourth Meeting of the American Association for the Advancement of Science. Some fourteen papers and addresses—most of which have since appeared in our CONTRIBUTIONS in POPULAR ASTRONOMY—were delivered at the sessions of our Society. Judged by the quality as well as by the number of the scientific communications presented before it, the Second Annual Meeting was, I think, a marked success.

Three committees have been appointed in the course of the year now ended: the large and important Advisory Committee for the Proposed Meteoritical Institute, scheduled to convene for the first time at this Meeting; the Committee on Incorporation; and the Committee on Membership.

Under date of April 24, 1935, word came from the Permanent Secretary of the American Association for the Advancement of Science that its Executive Committee had recently "voted to accept the Society for Research on Meteorites as an associated society." As a result of this action, our Society is meeting this

*The opening address of the President, communicated to the Third Annual Meeting of the Society, held at the University of Minnesota, Minneapolis, on June 26 and 27, 1935.

year with the Association, not merely as a guest, as it did last year at the University of California, Berkeley, but in its own right as an accredited society of the Association. The foregoing items summarize the main "administrative" events of the past twelvemonth, in the course of which our membership has passed the hundred mark.

I wish now to say a few words about the program and the needs of the Society. You have on the agenda for this meeting a number of proposed Amendments to the Constitution and the By-Laws. These are recommended by the Executive Committee of the Council, after due deliberation, for adoption by the Society at this time. If the proposed Amendments carry, the lately appointed Committee on Incorporation, which includes the members of the Executive Committee of the Council *ex officiis,* will in the near future transact the legal business incident to the incorporation of the Society.

As has been previously stated, the Advisory Committee for the Proposed Meteoritical Institute will assemble for the first time in one of these sessions. I myself have had nothing to do with the proposal for the establishment of this institution, and so I may speak more freely on the subject than I should otherwise feel at liberty to. I believe that the creation of an Institute such as our Secretary has outlined in his paper, "Proposing an Institution for Meteoritical Research,"* would be of the utmost consequence to the cause of meteoritics and is therefore worthy of the official endorsement of this Society. Accordingly, I trust that the members of the Advisory Committee who are present at this meeting will give the matter of the proposed Institute their serious consideration and do anything that they may deem meet to expedite its foundation and insure its success. I feel that, if the proposed Institute come into being, the closest relations and the most effective coöperation should exist between it and the Society which would be, in large measure, responsible for its inception.

Our official journal, POPULAR ASTRONOMY, generously donates to our cause, two pages in each of its ten annual numbers. A small charge required to cover the cost of printing, is made the Society for all pages, in excess of two per issue, which it consumes. Clearly, we cannot condense all of our yearly material within the narrow limits of twenty pages, especially since we publish in full in the CONTRIBUTIONS as many of the papers which are communicated to the Annual Meetings as are suitable for the purpose. Moreover, we plan, next January, to have all the CONTRIBUTIONS of the present year reprinted in titled covers and distributed without charge among the members of the Society. We hope to continue this practice—the advantages of which are so apparent as to call for no further comment—until such time as the Society may have an organ of its own. It is doubtful, however, whether the existing income of the Society, which is derived almost wholly from the membership fee of one dollar, will suffice to defray the combined expenses of the additional pages which we are obliged, in justice to this service, to utilize in POPULAR ASTRONOMY, and the reprinting of the CONTRIBUTIONS of the current year at the beginning of the next succeeding one. I shall appreciate it if the members in attendance at this meeting will take the matter under advisement and if possible find a way whereby the Society may in the future adequately finance the publication and reprinting of its CONTRIBUTIONS. It is hardly necessary to observe that the publications of every scientific organization constitute one of its most valuable products, and that to curtail them is seriously to

*Delivered at the meeting of the American Association for the Advancement of Science, at Pittsburgh, Pennsylvania, in December, 1934.

impair the usefulness of the organization. In my opinion, the principal desideratum of the Society at this time is a grant sufficient to enable it to prosecute, unhampered, its publication program. I hope that some feasible solution of the problem may be worked out before this meeting adjourns.

With these few remarks I leave you to proceed with the really important features of the meeting—the scientific papers which you have come to hear and by which the occasion will be remembered.

Report on the Third Annual Meeting of the Society

By H. H. NININGER, *Secretary*

The Society held its Third Annual Meeting on Wednesday and Thursday, June 26 and 27, 1935, in Room 110, Pillsbury Hall, University of Minnesota, Minneapolis, in connection with the meeting of the American Association for the Advancement of Science.

In the absence of the President and the Vice-Presidents, the Secretary conducted the meeting and the Assistant to the Secretary served as Secretary *pro tempore*.

The first session opened with the reading by the Secretary *pro tempore* of the President's address on "Some Remarks on the Program and the Needs of the Society."

Six scientific papers were read at the various sessions, and lively discussion ensued.

Special interest was manifest in a paper presented by Mr. H. H. Nininger of the Nininger Laboratory, Denver, Colorado, on "The Surface Features of Meteorites" as related to the findings of engineers in their study of stream-lined designs. Professor Behnlein of the Department of Aërodynamics of the University of Minnesota contributed a valuable discussion on this subject.

In the absence of Dr. C. C. Wylie of the University of Iowa, Dr. E. S. Haynes of the University of Missouri discussed the fall of meteorites which occurred near Archie, Missouri, on August 10, 1932, and furnished convincing evidence that these meteorites did *not* belong to the Perseid stream, despite the fact that their fall took place at the time of maximum intensity of the shower.

The fall of meteorites near Purna, Purbhani District, Hyderabad (Deccan), India, on September 29, 1928, was described in a paper communicated by Principal Mohd. A. R. Khan of the Osmania University College, Hyderabad (Deccan), India.*

Papers on other miscellaneous subjects were submitted by Mr. Oscar E. Monnig of Fort Worth, Texas, Mr. Bemrose Boyd of the University of Iowa, Mr. John Davis Buddhue of Pasadena, California, and Mr. Nininger.

Of particular interest were descriptions of two new meteorites of unusual composition, supplied by members of the Department of Mineralogy of the United States National Museum, in Washington, D. C. Dr. W. F. Foshag, Curator of the Department, classified the fall of March 24, 1933, near Pasamonte, New Mexico, as a *Howardite*, while Mr. E. P. Henderson, also of the National Museum, and Mr. Harry T. Davis of the North Carolina State Museum, described the stone which fell on April 21, 1913, in Moore County, North Carolina, as a *Eukrite* with very interesting flight markings.

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*See "The Meteorite Fall of 1928 near Purna," by Mohd. A. R. Khan, published in and reprinted from the *Journal of the Osmania University College*, Hyderabad (Deccan), India, Vol. II, 1934 (2 pp., 3 figs.).

Further Studies on the Surface Features of Meteorites*

By H. H. NININGER

This is the second in a series of papers, the first of which appeared in *C.S.R.M., P.A.*, **43**, 121-6, 1935. The present paper treats of the following subjects:

Stream-lining, i.e. the forms of meteorites as related to the position assumed by them while falling. Here it is revealed that meteorites travel generally in a position such that they encounter the resisting air broadside, though in some cases the longer diameter is allowed to bear the brunt of the impact. A tapering rear is seldom found in meteorites.

The well-known *pitting* of the surfaces of meteorites, the writer finds reason to believe, takes place in the very last stage of the burning flight. This conclusion constitutes an argument in favor of rapid surface disintegration of all meteorites during flight.

Orientation is not the rule in meteorites, as some writers, without making a quantitative study, have stated. Only about 5.4%, or 245 out of 4320 individual stones investigated, showed orientation. In irons the percentage was much higher —about 28%. This fact is considered to be due to less frequent shattering of the irons in flight. The highest percentage of orientation, however, was found in stones of extra high velocity, namely, those which fell in the forenoon hours and therefore encountered the earth in head-on collisions. In this case, the percentage for 68 stones was 37% exhibiting orientation. Apparently, when the velocity is great enough, the stone is carved away by the air, as would be a potato by a sharp razor, and there is no turning over of the stone. Among the morning falls, a shower which occurred at daybreak—the time of maximum relative velocity of the earth and the meteorites—showed orientation in 50% of its 44 stones.

*The abstract of a paper delivered at the Third Annual Meeting of the Society.

Terminology in Meteoritics*

By H. H. NININGER

A survey of the literature reveals many inconsistencies in the use of terms relating to meteorites and meteors.

The author finds eleven different meanings assigned to the word *meteor* by different writers of prominence and that often the same writer uses the words *meteorite* and *meteor* inconsistently.

It is pointed out that meteoritics is a borderland science growing out of astronomy, geology, and mineralogy, and that the resultant lack of unity among the various writers is responsible for their inconsistencies. Attention is called also to the lack of a term by which may be designated those who make the study of meteorites a profession.

The word *meteorite* is found to be well established as the name applied to masses of solid matter fallen from space to the earth. This word is used to designate also this same matter while it is still in space. A smaller number of writers apply the term to mean the burning missiles while they are falling.

Conflicts are best avoided by those who distinguish between *meteorites* as *material substance* and *meteors* as the *light phenomena* produced by meteorites during their flight through the atmosphere.

*The abstract of a report presented by the Chairman of the Committee on Terminology at the Third Annual Meeting of the Society.

The Determination of Fireball Durations*

By Bemrose Boyd

Random fireballs and detonating meteors will ordinarily not be observed photographically. Estimates of duration are not reliable unless checked in some manner. An attempt is therefore made to establish a technique for obtaining information which will give the velocities of fireballs more accurately than they have been known in the past. Experiments with artificial illumination show that durations obtained by timing re-enactments of motion or repetitions of counts are considerably more accurate than reproduced intervals, and the latter are more accurate than estimates.

University of Iowa, Iowa City, June 18, 1935.

Secretary's Office: The Nininger Laboratory, 1955 Fairfax Street, Denver, Colorado.

Editorial Office: The Department of Astronomy of the University of California at Los Angeles.

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*The abstract of a paper communicated to the Third Annual Meeting of the Society.

An Argentine Meteor

In *Revista Astronómica,* Vol. VII, No 2 (Buenos Aires, March-April, 1935) Dr. J. Hartmann gives a resumé of obesrvations of a brilliant meteor which crossed above the Argentine Republic on the night of January 12, 1934. The phenomenon was seen by a large number of persons, due to the fact that many people were enjoying the cool of the evening out of doors after a hot summer day. Publications in the local newspapers requesting exact information brought over thirty replies. Several of these, it was found later, undoubtedly refer to another bright meteor seen on the evening of the preceding Christmas. Of the remainder, some twenty contained useful information. All replies which offered hope of reliable data were followed up by Dr. Hartmann, either by correspondence from La Plata Observatory or, when possible, by personal interview.

The individual results were conflicting, as such observations by inexperienced persons always are, but by taking with him to Göttingen, and carefully sifting there, all the information accumulated before his leaving La Plata in May of 1934, he was able to arrive with reasonable certainty at the following conclusions:

Time. The meteor appeared within a minute or two at most of $22^h\,50^m$, Argentine summer time (1934 Jan. 13, $1^h\,50^m$, G.C.T.). The duration of its visibility was nearly a minute.

Apparent Path. The best-determined point of the projected path lies between Buenos Aires and Rosario, in each of which cities there were several observers. This point is situated at 33° 44′ S, and 59° 38′ W and the meteor passed over it at a height of 37 km. The beginning of visibility was approximately over the point 29° 25′ S, 57° 53′ W, at a height of 131 km. The most southerly point fairly well determined is 800 km away, at 36° 14′ S, 60° 44′ W, where the height was 25 km and where it ceased to be visible to observers in Buenos Aires; it seems, however, quite probable that some fragments continued to be visible to those more favorably situated, even beyond Bahia Blanca (38° 43′ S).

Aspect. Its brightness was such that at a distance of 150 km or more it appeared as of stellar magnitude about —6. The meteor itself shone with a yellowish light, but was surrounded by a brilliant greenish-blue halo, separated from

the central body by a zone much less bright. At least two "explosions," or breaks, occurred, though no sounds were reported. The first of these occurred closely beyond the best-determined point above mentioned, after about 530 km of the visible path had been covered.

Velocity. Combining all observations in which both azimuths of beginning and end of observation and estimated duration were given, the horizontal component of the velocity relative to the earth's surface was deduced as $(32.0 - 0.034k)$ km per second, where k is the distance in km from the point of beginning of visibility. Taking the inclination into account, the velocity at this point results as 32.7 km per second.

Path in Space. Correcting for the zenith attraction, Dr. Hartmann deduces a velocity of 30.7 km/sec relative to the earth (over and above the effects of the earth's gravitation) and the coördinates of the radiant as: $\alpha = 111°.2$, $\delta = +47°.6$; from these he then computes the planetary velocity as 45.1 km/sec from $\lambda = 61°.9$, $\beta = +16°.9$, corresponding to a hyperbolic orbit with $\Omega = 292°.2$, and $i = 21°.6$.

B.H.D.

Notes from Amateurs

Cleveland Astronomical Society

Through the kind invitation of Mr. and Mrs. Curt Muller, our Summer Solstice meeting was held at their home on Friday, June 21.

A placard was posted at the entrance of their grounds at 3560 Rocky River Drive which served to direct the forty-three members who attended.

A Bardou 3-inch refractor and your scribe's 6-inch refractor had been promised, as well as many field glasses, but owing to cloudy weather no observing was attempted.

Professor O. L. Dustheimer was the speaker of the evening on "The Stars in the Summer Sky." Many will remember his series of radio talks which were closely followed by the public in general and especially by our group.

Dr. Nassau then proposed an astronomical game which seemed very original. He indicated the cardinal points of the compass and after we were oriented would point to some part of the ceiling and demand to know what constellation was there. We were all surprised at the quick answers received.

After lunch it was decided to have the next meeting July 20, location to be announced later. Those interested should communicate with Mr. R. A. Gordon, Secretary, 1539 Union Trust Building, Cleveland.

Don H. Johnston.

14 Lincoln Drive, Cleveland, Ohio.

Amateur Telescope Makers of Chicago

The Amateur Telescope Makers of Chicago held their monthly meeting at the Adler Planetarium and Astronomical Museum, Chicago, on June 2.

Gerald E. McCord, who is treasurer of the club, spoke on sunspots. He described the sunspot cycle, location, and polarity of spots and their connection with the solar prominences. The lecture was illustrated by slides, some of them made by Mr. McCord, which showed graphs giving some of the results of his observations during the last three years. Photographs of the sun in hydrogen and calcium light, spectra of the spots and some beautiful pictures of prominences were shown and described.

1319 W. 78th Street, Chicago, Illinois.

Wm. Callum, *Secretary.*

Amateur Telescope Makers of Chicago

The Amateur Telescope Makers of Chicago had an outing at Waverly Beach, Indiana Dunes State Park, on Saturday, June 29.

We spent the afternoon on the beach and went to the Carlson Planetarium at Porter, Indiana, in the evening. The Carlson Planetarium is on U. S. Route 20 about 12 miles east of Gary, Indiana. It is the result of the efforts of Dr. E. H. Carlson whose life work is to arouse interest in astronomy and to guide those interested and help them to increase their knowledge of the heavens. The walls are covered with diagrams which help to give visitors a conception of the scale of the orbits of the planets and comets, also the respective sizes of the members of the solar system. There are a number of models of the constellations and also two orreries under construction. There are lectures and star studies every Thursday evening and other talks whenever the occasion requires it.

There were about thirty of our members there, many bringing their own telescopes. Many of Dr. Carlson's group brought telescopes also. Mr. L. E. Armfield, secretary of the Milwaukee Astronomical Society, with a group of his members and Mr. Frank Preucil, president of the Joliet Astronomical Society, were with us.

Dr. E. H. Carlson spoke on the application of astronomy to every day affairs and after remarks from some of the visitors we went out under the sky. There were 18 telescopes in operation from 2-inch refractors to 10-inch reflectors, and they were kept busy.

It was a very enjoyable outing and the fact that many of the amateurs of the middle west became acquainted with each other means that there will be more coöperation between the groups.

WM. CALLUM, *Secretary.*

1319 W. 78th Street, Chicago.

Zodiacal Light Notes

By FRANKLIN W. SMITH

The present season is the least favorable of the year for the observation of the Zodiacal Light from northern stations because of the length of twilight and the smallness of the angle between the ecliptic and the horizon both after sunset and before sunrise. Consequently there are few observations to report. The evening Zodiacal Light was last seen here on May 24. At 9:30, E.S.T., it was traced upward from Gemini at the horizon, through Cancer, and into Leo. The northern edge was traced through ι Cancri and λ Leonis, between η and γ Leonis, and then to χ Leonis which marked the apparent apex of the light cone. The southern edge passed through α Cancri and o Leonis. The axis of the cone was therefore a few degrees north of the ecliptic and the elongation of its apex from the sun was about 102°.

The evening Zodiacal Light cone will remain unfavorably situated for observation throughout the summer and autumn, but the morning cone may be readily seen in September after it has crossed the Milky Way. The Gegenschein reaches its most favorable situation for northern observers in late September and early October because it is then far from the Milky Way and in a region which contains no bright stars.

407 Scott Avenue, Glenolden, Pennsylvania, July 12, 1935.

Asteroid Notes

By HUGH S. RICE

Among the hundreds of asteroids whose orbits are known through celestial mechanics, the best one for observation during August and September is the planet 4 Vesta, which assumes a retrograde motion at this time in the constellation Aquarius. It is the brightest of the minor planets, the magnitude (about 6) being such that it can be seen with a small telescope or a pair of binoculars, indeed occasionally with the naked eye in particularly clear atmosphere. The observer should refer to the June-July issue of this magazine for the plotted path of Vesta; the planet will be seen to pass very close to a number of stars in its course.

A fainter asteroid, but one of the important ones, 3 Juno, will be coming into visibility toward the close of August. It is, however, a morning object then, but with time it becomes more convenient for observation. A chart of the exact positions can be found in the Supplement to the Handbook of the Heavens, published at this museum. It is proposed to show such a chart in the October Asteroid Notes of POPULAR ASTRONOMY.

American Museum of Natural History, New York, July 22, 1935.

General Notes

Editor's Note.—The delay in the sending out of this issue is attributable to several circumstances. First, some of the essential material was late in arriving; second, the editor is spending the summer at the Leander McCormick Observatory of the University of Virginia, and letters take time in transit; third, the extremely warm weather reduces the speed of the printing presses. It, perhaps, is not so bad, because this is the issue for August and September. The next issue will be mailed as usual on October 1.

Dr. E. A. Fath, director of the Goodsell Observatory is continuing his research in photometry at the Lick Observatory during the summer.

Dr. V. M. Slipher, director of the Lowell Observatory, has been awarded the Bruce Gold Medal of the Astronomical Society of the Pacific for this year.

Dr. Charles Edward St. John, a member of the staff of the Mount Wilson Observatory for more than a quarter of a century, and well known for his studies of the phenomena of the sun, died in Pasadena, California, on April 26, 1935.

Dr. Robert Grant Aitken, the retiring Director of the Lick Observatory of the University of California, received the honorary degree of Doctor of Laws at the commencement of the University of California at Los Angeles on June 21, 1935.

The Griffith Observatory and Planetarium in Los Angeles were formally opened to the public on May 14, 1935. An address of acceptance was made by Mrs. Mabel V. Socha in behalf of the Board of Park Commissioners into whose charge the institution has been given. Other addresses were made by Dr. Walter S. Adams, Dr. Robert A. Millikan, and Dr. Philip Fox. Dr. Fox is serving at present as guest director, and Dr. William F. Meyer is the associate director. Dr. Dinsmore Alter and Mr. Harold F. Balmer are other members of the staff.

Giovanni Schiaparelli*

A century ago on precisely the fourteenth of March, 1835, the great astronomer Giovanni Virginio Schiaparelli was born in Savigliano (Piemont). In this city of his birth he attended the elementary and secondary schools and under the guidance of an amateur astronomer (P. Dovo) he began to study the stars and the constellations.

In 1850 he entered the University of Turin and in August, 1854, he was graduated from it with the title of hydraulic engineer and civil architect. Following this he gave himself up to astronomy and in 1857 he obtained a subsidy to go to improve his astronomical studies in a strange country. From February, 1857, until June, 1859, he was in Berlin with the celebrated astronomer, Encke; then he went to the observatory of Pulkova to be near the celebrated V. Struve. In July, 1860, he returned to Italy to the position of second astronomer in the Observatory of Brera (Milan). Here he entered upon his extensive activity in fields of research, of study, and of observations.

On April 29, 1861, he discovered the small planet Esperie (69). He busied himself with several questions, for example, the tails of comets. In September, 1862, the director of the Observatory of Brera, F. Carlini, died; Schiaparelli was advanced to his place, and he was the director of this observatory until 1900.

Among his most important work, it is necessary to mention, first of all, his studies of the meteorites, the origin of which he discovered in the disintegration of comets. He wrote five celebrated letters to Father Secchi and then he published several works. In 1866 he found the correlation between the orbits of the Perseids and the comet of Tuttle 1862 III, and, in 1867, he found an analogous correlation between the elements of the Leonids and of the comet Tempel 1866 I. In 1868 he received a gold medal from the Italian Socity of XL, and the Lalande prize of the Academy of Sciences of the Institute of France. In 1872 he obtained another gold medal, awarded by the Royal Astronomical Society of London.

During these years his activity was not limited to observations and to research; he studied also the ancient astronomy, especially Greek; moreover, he made several studies outside of astronomy (meteorology, geodesy, magnetism, geology, natural sciences, history, etc.).

In 1875 he started a series of observations of double stars, a series which he discontinued only in 1900, after having made more than 11,000 micrometric observations. In 1876 the Léopoldine-Caroline German Imperial Academy of Naturalists offered him the Cothenius gold medal.

In 1877 he began the study of the surface of Mars, which he also continued in the following years, finding numerous details which gave rise to many discussions among astronomers. In 1882 and 1883 he began also to study the surfaces of Mercury, Saturn, and Uranus.

He was named senator of the kingdom of Italy in January, 1889. The same year he published the results of his observations of Mercury, discovering that the period of rotation is equal to that of revolution. In 1890 he came to the same conclusions for Venus. In 1890 he was awarded the Lalande prize which he had already received in 1868. He had been acclaimed a member by nearly fifty scientific academies of all the countries, and he had received the insignia of several equestrian orders.

In 1900 he abandoned the directorship of the Observatory of Brera, in spite of the requests which everyone had made him. In the last years of his life he studied especially the astronomy of the Hebrews, the Assyrians, the Babylonians,

*Translated from the French by Gertrude Gingrich.

and other ancient peoples; he was favored in his studies, by his profound knowledge of several ancient languages. He published works, which, like the preceding ones, were given wide circulation in the different countries of the world. However, even in these years, he never left the astronomy of observation, and he also made other researches and other works on meteor radiants, on the orbits of comets, etc.

He died at Milan on July 4, 1910, while he was working on a large history of ancient astronomy.

This is the summary of a life, told in a very simple manner, of a great Italian astronomer, the centenary of whose birth we are celebrating.

It would take too long a time to analyze his scientific work here; it will be sufficient to end these lines in saying that the astronomers honor him, rightly, as one of the most glorious among the great Masters of the Science of the Heavens.

Bologna. E. LORETA.

Book Review

An Introduction to Astronomy, by Robert H. Baker. (New York, D. van Nostrand Company, Inc.)

This book is designed for shorter courses than is "Astronomy" by the same author which has proven so successful a a college textbook. The book is arranged as a textbook with questions at the ends of the chapters to test the care with which the text has been read and understood but the book is quite suitable for any general reader who may wish a brief, authoritative, up-to-date, non-mathematical treatment of the subject. Obviously the most perplexing problem the author had to face was the decision as to what to include and what to exclude of the very large amount of material pressing for a place in a brief book. The book consists of slightly over three hundred pages. The author's judgment in this respect I think has been excellent especially in view of the fact that he has provided a larger book for those who wish a more elaborate treatment. The book is a bit unusual in that it contains two chapters, 50 pages, on the stars and constellations, including maps, of the same general nature as Young's Uranography. Information scattered here and there on the especially interesting astronomical phenomena in prospect for the near future is very acceptable.

The publishers have left little to be desired in the attractiveness of the book. The errors noted in a rather careful reading of the book are not numerous and are largely of an accidental nature. A list of these errors has been sent to the author. Space does not permit their listing or discussion here.

SAMUEL G. BARTON.

Correction.—In the preceding (June-July) issue, page 391, line 13, before the word "factors" insert the phrase "and come close to the sun."